The Builder.

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Antiquities Classified on a Geological Basis.

ONE of the most suggestive papers read at the British Association meeting was that by Professor Flinders Petrie on "Sequences of Prehistoric Remains." He pointed out that hitherto only very vague and general terms covering large periods had been used in naming prehistoric remains, those terms referring to places and and not to age. But, if we possessed a perfect record of an unlimited number of contemporary groups of objects (as from tombs), all of which objects had had a time of invention, popularity, and decay, and the use of which overlapped each other, it was clear that with patience it would be possible to arrange all the series of groups in their order of time, and so establish definite sequences amongst the various objects. Such a task, he remarked, would be like that of settling the sequence of scattered geological beds from the remains found in each. If, then, a sequence could be established, a scale of notation was needed, and he proposed that as a scale of years was impossible a scale of "equal activities" should be adopted.

The time has undoubtedly arrived when a more systematic method of classifying prehistoric antiquities should be devised, and everybody will welcome this attempt to set the ball rolling. Professor Flinders Petrie does well to compare his proposals with the methods adopted long ago by geologists in classifying stratified rocks, but we do not think he goes far enough in that direction. The gradual evolution of the nomenclature and correlation of fossiliferous rocks has been at work for well-nigh a century, and antiquaries should profit by the experience thus gained by geologists. At first a rough and ready, tentative, and illogical method of classifying the rocks was adopted; the different strata were given local names, and the rocks were subdivided very unequally. All this, perhaps, was inevitable in the first struggles of the science to get upon its feet, but the net result, even with subsequent "improvements," is ludicrous in the extreme, and antiquaries in devising a somewhat similar classification for their uses should take warning accordingly. Here are some of the difficulties of geological classification, looked at not from the British standpoint, but from an international point of view. The birth of the nomenclature of stratified deposits took place in England. When the general principle that rocks could be identified by their fossil contents was first established here, the discoverer and his followers gave local names to the subdivisions they pegged out. It was not then known that these divisions could be followed all over the continent, and in some measure even all over the world, though William Smith was philosopher enough to have surmised it. Thus the earlier investigators saddled the science with "Oxford Clay," "Kimmeridge Clay," "Bath oolite," and the like. Then we find enormous divisions dubbed Silurian (after the Silures, an ancient tribe on the Welsh borders), Cambrian (Cambria, Wales), Devonian (from Devonshire), Carboniferous (in allusion to its being coal-bearing), Trias (because of its tripartite division in certain parts of the continent), Jurassic (from the Jura mountains), Wealden (from the weald of Kent and Sussex), Purbeck and Portland (both in Dorset), Cornbrash (because the material is good for "brashing" land), Eocene, Miocene, Pliocene (in allusion to the relative abundance of organic remains, the species of which are still living), London clay, Woolwich and Reading beds, Osborne beds (cheap patriotism), Wenlock beds, Ludlow beds, and so on. The majority of these names were adopted by the leading continental geologists at the time and applied to the deposits of similar geological age in their vicinity. Then the spirit of jealousy seems to have crawled uppermost—Why should we use these English terms? they asked one another, and then began to create some of their own. In later years continental geologists have to some extent adopted nomenclatures ot their own, a different one for almost every country, and often more than one nomenclature in a single country. It is impossible, now, to extract any order out of this muddle, which is getting thicker and thicker, and only the analytical mind can understand it. The chaos has arisen largely from jealousy, as everyone knows who is personally acquainted with many leading European geologists. Of course, in those countries where distinctive deposits are found that are not represented in Britain, it is only natural that the discoverers should christen them themselves. Thus we have the delightful names of Pamunkey beds, the Negaunee formation, Algonkian beds, and the like, from across the Atlantic.

Professor Flinders Petrie will do well to study these awful examples of undigested evolution, and in creating a nomenclature of his own for prehistoric antiquities to remember that if the nomenclature is to be of world-wide application it must not be based on the antiquities of any particular country (Egypt, for instance), but must rest on a more secure foundation. The periods marked out must not be designated by local names, nor the names of dynasties, nor in honour of any particular investigator. It is a gift to be able to compound names which mean nothing, but in our opinion these are the most useful for all-round purposes. Classifications are simply for convenience, and are of more universal application when they are not descriptive or geographical. A name is given to a period simply because we desire to recognise that period when it is alluded to.

In geology we have the "lower greensand," which is mostly reddish-brown in tint, and frequently of clay only; the "Thanet sand," which is argillaceous in places; "cretaceous" beds which do not contain a particle of lime; the "great oolite" which is locally non-oolitic; and "carboniferous" beds which contain no coal or carbonaceous material whatever. We insist on these ludicrous points because nothing is more certain than that the closest analogy exists between the method of classifying aqueous rocks and that which will obtain by the process outlined for prehistoric antiquities at the British Association. The most useful words, perhaps, are those derived from Greek, and if that language be adopted it should be adhered to, not one period designated by a Greek word, another by a Latin, and a third by an impossible mongrel combination of the two languages incorrectly Latinised. Again, one word is sufficient; there should be no equivalent to "Woolwich and Reading" series, "Oldhaven and Blackheath" beds, or Argile à Silex. To avoid international difficulties a

congress of competent men of all countries should settle the preliminaries. The congress should not be composed of a majority of men whose chief qualification is that they can afford to pay a few francs for the privilege of membership. It should be held as far away from the influence of well-meaning local magnates as possible; banquets, receptions, and international amenities should be dispensed with. The antiquaries of to-day are in a far better position to so construct a classification as shall be generally accepted, than geologists have ever been.

Professor Flinders Petrie is wise in not committing himself to a definite nomenclature at present. The following is an outline of his scheme. He begins by suggesting that all the available material from tombs, houses, &c., should be put in order, and then divided into a scale of equal parts. Such a scale, though not equal in time, would yet give a fair unit for measuring a civilisation. From the records of the excavations that his party have made in Egypt, the contents of some thousands of prehistoric tombs are exactly known. Every type of vase, of stone, or pottery was defined in a corpus containing over 1,000 forms, so that merely a letter and a number defined precisely what was found. The practical process for dealing with this material was by writing out the contents of each grave on one slip of card, and then sorting the cards into such order that there should be the minimum dispersion of each type number. The methods of sorting the cards into the original order of the graves (as nearly as possible) depends on various principles, as follows:— 1. Any certain superposition of graves, one later than another. 2. Any clear and unquestionable series of changes of form or of manufacture. 3. Statistical methods; sorting graves by the relative proportions of types in common with ages before or after them. 4. Method of style, serving to group in sequence the forms which were clearly intermediate between others, after their approximate place was already fixed by statistics. 5. Method of compression; the earliest and latest examples of each type to be examined, to see if it is possible to concentrate them. Thus, a period may be broken up into a scale of fifty parts of "equal activities," and it is possible to define the age of every type of object found in that scale, as 38 to 41, 53 to 65, &c.; these numbers might be termed the sequence dates, or S. D.

The germ of a logical classification is here, but the numbers will have to be discarded, and definite names given to the divers epochs. In the course of the discussion on the paper Dr. Sebastian Evans remarked that Professor Petrie had laid the foundations of a new science. It ought not to be forgotten, however, that the subject has been in the air for a number of years; what it wanted was an organiser, and he has now come to the front. The method is strictly geological if we substitute aqueous rocks for tombs and houses, and fossils for pottery and the like. We venture to think, however, that considerable concessions will have to be made to those antiquaries who are accustomed to classify antiquities according as they indicate a particular style of art, which style obtained during a more or less definite period in a particular geographical region. The antiquary is not obliged to look at the antiquities as though they were mere units finding a place in a mathematical scale. He would be falling into the same error as the geologist who merely regards a fossil as a chronological unit. The antiquary must still be dominated by the style of the antiquity, in the same way as the modern palæontologist is beginning to recognise the chronological value of philogenetic relationships in certain restricted groups of fossils. Standing alone, a fossil species may possess little or no interest from a chronological standpoint, owing to its very extended range in time. That is to say, certain species may be propagated generation after generation with little or no change in external form, whilst others living through the same periods may change so materially as to bear no recognition to their ancestors of a few generations back. The philogenetic relationships, established principally by the study of the embryonic hard part, and the earlier stages of growth, may enable the changes during successive periods to be readily traced, and the ancestral tree to be satisfactorily constructed.

This is no new method to the antiquary, though he may not have recognised the analogy. Those who have studied ancient Greek coins will be aware of the method of classification adopted by numismatists, whereby the coins of a single city have been arranged in periods according to their style. Again, by that process correlation with corresponding periods in reference to the coins of neighbouring cities is rendered possible, although historic records may be absolutely missing from the coins. The Greek numismatist, however, has one point greatly in his favour, inasmuch as he can often find a dated coin, around which he is able to group undated ones. The Egyptologist is denied that privilege, but he can at least work on a few fixed points of chronological value, of assistance in devising a general scheme. The study of style, and its value for chronological purposes, finds its analogy in the study of the phylogeny of organic remains, though development in both cases was unequal and largely depended on local circumstances.

The general tendency to specialise nowadays is fatal to the successful creation of a true organic nomenclature for antiquities. Professor Petrie undoubtedly recognises this fact. Even businesslike congresses could do but little to minimise this evil. It is not that the specialist has no sympathy with his brother antiquaries studying other branches of the subject—it is the impossibility of his being able to do justice to his work unless he specialises and leaves their branches alone. Thus, he may be incapable of pronouncing upon points not coming directly within his sphere, and he is more and more tempted to organise a classification of his own to suit his particular part of the subject. It is the same in all branches of science, but it is not too late for the master mind to look over the whole and bring the elementary facts of each branch of the study of antiquities into correlation with each other, and this is all that can be hoped for.

For the purposes of correlation on the broad scale, the geologist uses the word "homotaxis," not "contemporaneity." It is recognised that two widely separated series of strata, presenting many analogous features in common, may not have been deposited exactly contemporaneously, but at about the same period. The one may have been laid down a little before or a little after the other, and not necessarily at the exact same time. To define this state of affairs the term homotaxis is used. Thus, the geologist says that the homotaxial equivalent in Australia of such and such a series of deposits in England is so and so. Professor Petrie has foreseen the importance of this principle, apparently, when he alludes to the overlapping of groups of objects from one period to another. The correlation of antiquities on the broad scale will no doubt intensify the principle, and lead to the establishment of homotaxial equivalents in "periods" of antiquity.

The geologist is a little better off than the antiquary, in that the organisms represented in the strata were not quite of such a migratory character when they were clothed in the flesh as were the peoples of the human race. Although a group of organisms may have died out, there is always abundant evidence of the period in the shape of other strictly contemporaneous groups which still lived on. The overthrow of a race of people, and the suppression of its peculiar characteristics and style, although not exactly cataclysmic, may lead to the almost complete effacement of subsequent evolution of the race and its antiquities by the absorption of that race by the conquerors. This is one of the greatest difficulties encountered in establishing a true sequence. The barbarous and the semi-civilised meet on the same field, their antiquities are mixed together, and, in the absence of any information as to the facts, it is not always easy to assign these conflicting contemporaneous elements to the respective peoples. Nothing but the study of style could eliminate them, or trace the evolution of the commingled elements. It is here that the mathematical method by cards, &c., would be most difficult of application; and the day is far off when the study of prehistoric antiquities will be able to rank as an exact science—there is no need for it to do so.

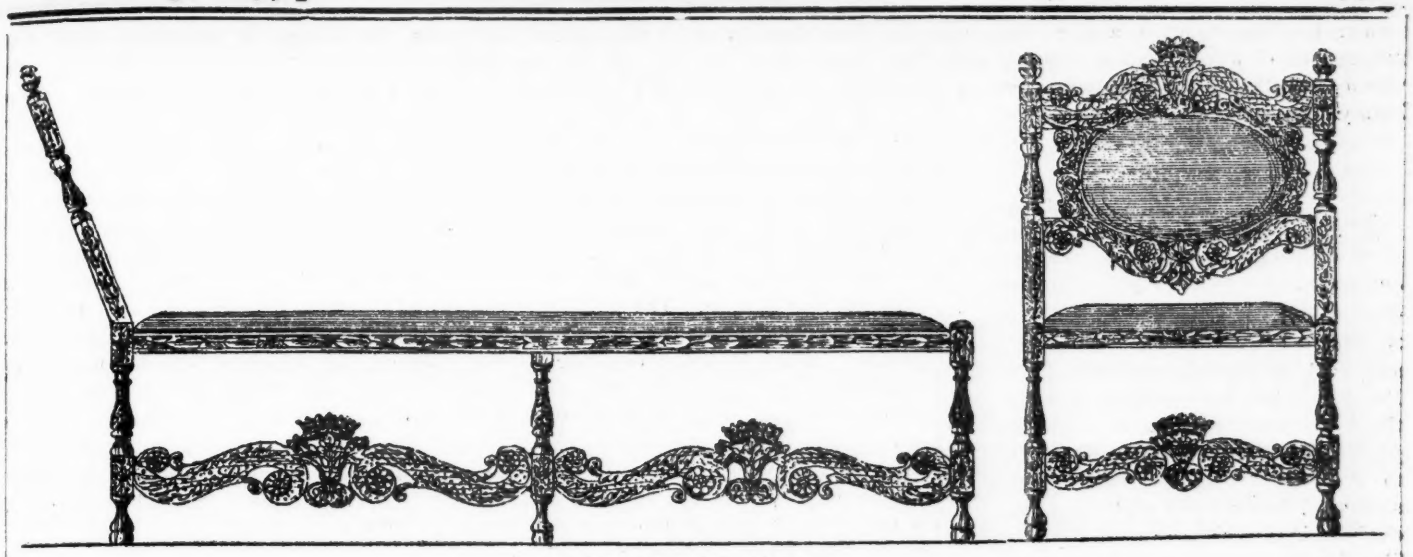
Finally, we may say that, although Professor Petrie's suggested methods of classification may not be acceptable to all antiquaries, he is to be most heartily congratulated on his bold effort to evolve some sort of order out of what can, at the present time, only be called chaos.

SCOTTISH WOODWORK.

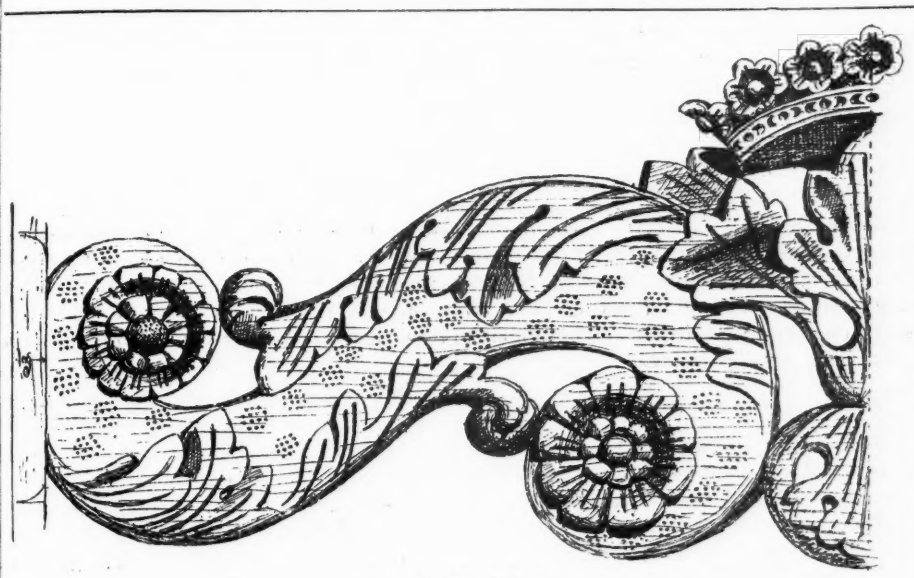
UNDER this title Mr. William Small has produced an exceedingly fine folio volume of drawings of woodwork now existing in Scotland,* though, as he observes in his preface, it may be questioned whether they are all of native workmanship, or imported from the continent; or, as we may otherwise suggest, by French workmen brought into Scotland. There are, however, a good many among the objects figured—house furniture, pannelling of rooms, shutter boards, &c.—which seem undoubtedly of native manufacture.

Can we recognise in these any qualities which particularly distinguish them from English woodwork of the same period? Mr. Small notices the wardrobe from Stirling Castle, plate 25, as having "an undoubted Scots character or feeling;" but it would be

* "Scottish Woodwork of the Sixteenth and Seventeenth Centuries." Measured and drawn for the stone, by John William Small, architect. Stirling: Eneas Mackay. London: Bernard Quaritch.



Couch from Darnick Tower.



Detail of End Rail

rather difficult to define in what particulars this is to be detected. In this and other cases the difference from English work of the same period seems to lie mostly in a certain rudeness and simplicity in the carving and in the nature of the ornament employed. The particular example just referred to is a very characteristic piece of work. It is in three divisions separated by narrow bands of ornament; the upper stage treated in three square panels of equal size; the two lower ones with upright rather highly ornamented panels at the sides and plainer ones of different shape in the centre, the vertical divisions of the upper story not coinciding with those of the two lower ones. The lower side panels have each a carved head in high relief in an oval in the centre, the remainder of the panel being covered with flat foliage ornament of very free line, but not very refined in detail. The author suggests that the raised heads were used as handles to pull the doors open; there are no handles of any other kind; but it seems rather doubtful if they were deliberately intended for this purpose, as the section is only a half circle, and they would not have afforded much hold. The whole is a very interesting piece of furniture. Preceding this in the order of the plates is the remarkable cabinet from Stirling Palace, now in the possession of Sir W. Stirling-Maxwell. The character of this is very different from that of the wardrobe; the carved detail is much more refined, the heads are much better carved. There is a good deal of pretty and effective inlay work in some of the panels, in which "many of the portions are burnt at the edges and other parts to give variety and shade." The two lower panels show architectural views, as appears in the general drawing, but we are not told whether these are inlay, or how they are produced, nor is there any detail of them; from the slight indication in the drawing they have a foreign character, which increases the probability that this is not Scottish workmanship. The moulding of the cornice is finely profiled.

Among the most interesting though not the most elaborate objects figured are a series of "shutter-boards," as they are obviously a local fashion in Scotland. They formed, says the author, the lower part of the windows, generally occupying more than half the space, and were made in two leaves to open inwards, the top part of the windows being filled with fixed glazing, so that the shutters were the only means of regulating the entrance of fresh air. This, and the small size of the windows, may be taken to be characteristic of Scottish habit in domestic architecture, where neither light nor air were introduced in any ample proportions. They are mostly very simply treated, but the centre stile which parts the shutters is in two or three instances decorated with a little carved ornament; a couple of circles, for instance each with a flat radiating leaf carved in it, or rather incised, for it is hardly carving in the real sense of the word. The author notices that he has never found any two examples of these shutter boards treated alike.

There are few chairs among the examples given, and those not remarkable, but there are some interesting tables, among them a small and very simple one from Holyrood Palace, with legs treated with spiral work such as is often found on balusters in English work; it is a folding table known as "Queen Mary's work-table"; we agree with the author in his admiration for it, but we should doubt its being Scotch work. The most noticeable and characteristic piece of furniture of the lighter class is the couch from Darnick Tower, Melrose, part of the illustrations of which we have reproduced. It is now in the possession of Mr. Andrew Heiton, of Darnick Tower, but we should think is certainly exotic. The boldness and freedom of design and execution of the connecting rails between the legs is remarkable. The pad on the back, and the stuffed seat, are modern; originally there had been cane work. The same house supplies an example of a solid and monumental wooden canopy bedstead of rich and dignified character, but belonging to a different artistic world from the couch.

The palace at Culross furnishes a curious example of a floor bed, hinged on the level of the floor, and turned up during the day into a long low recess in the wall, where the bottom panels with their fluted decoration give it the appearance of a cupboard. The recess is surrounded by a simple inlay ornament of dark and light lozenges. The wall-panelling in the study in the same building is a curious bit of work, not complete however. Among examples of work devoid of decoration but excellent in its plain character we may draw attention to the pew from Burntisland Church (plates 92 and 93) and the oak screen from the hall of Falkland Palace, with its boldly moulded balusters.

The book contains one hundred plates, and the drawings, as far as practicable, are all to one scale, viz., 1 in. to the foot, but a scale accompanies each drawing, a most desirable addition which is too often wanting in books of this class. The details are full size (the one reproduced to accompany this notice is necessarily reduced to about half the size of the original). The author states that the measured drawings, with full size details, were all worked out on the spot, to ensure accuracy. The work has extended over some years, and we must congratulate the author on the excellent

result: he has produced a fine book of illustrations of an interesting subject, and which is worth a place in any architectural library.

NOTES.

Temple of Poseidon at Sunium.

AN inscription recently brought to light proves that the beautiful little temple, the ruins of which are familiar to every traveller in Greece who passes the promontory of Sunium, is not, as has always been hitherto supposed, dedicated to Athene, but to Poseidon. The inscription in question is of the fourth century B.C., and is an honorary *psephisma*, or decree dedicating a temple to Poseidon. The real Athene temple is somewhat lower down, and it presents precisely the irregularities described by Vitruvius. The Poseidon temple was destroyed by the Persians, and rebuilt by the Athenians about the middle of the fourth century B.C. It is entirely omitted by Pausanias, who notes the Athene temple. Our notice of this important inscription is taken from the *Berliner Philologische Wochenschrift*, September 2, 1899.

Excavations at Thermon in Ætolia.

To the same paper we owe a brief notice of the excavations carried on by the Greek Archœological Society, under the direction of Mr. Sotiriades at Thermon, the ancient place of assembly of the Ætolians. The excavations have been carried on during the past winter, and were resumed on August 3. Two important architectural inscriptions have been discovered, and there is abundant evidence that Thermon was a place of great importance from the seventh to the third centuries B.C. A large quantity of fragments of painted terra-cotta metopes have been found, and these, while the colour is still fresh, have been carefully facsimiled by M. Gilliéron.

Drought and the Welsh Water Supply Scheme.

THOSE who think of going to South Wales for water to supply the Metropolis would do well to study the rainfall in the district proposed to be captured, before finally making up their minds. A more alarming state of things could not be imagined as a result of the recent drought. The river Usk at Brecknock has not been affected by the little rain that has recently fallen, and is still very low indeed. Mr. John Lloyd, writing to the *Times*, states that the upper sill of Newton Weir stands fully 15 in. clear above the level of the weir pool, and the entire river passes down into the canal, except a feeble stream 3 in. in depth by 2 ft. 9 in., that flows through the fish pass. The last rise of the river was on May 19, when the banks were full; since then there has been no rise whatever. It may be well for us to recall what the chief engineer to the London County Council expects to get from this particular locality. The upper waters of the river Usk, together with some of its tributaries, including the river Crai, are culled to form material for the proposed Usk compensation reservoir, the capacity of which is estimated at 6,500 million gallons. Below this reservoir are several other tributaries of the Usk, including the rivers Bran and the Yscir. All these, together with the compensation water alluded to, being united, form the river Usk as it flows by Brecknock, and we have seen what that amounts to at the present time. The same state of things applies to that river's tributaries still lower down, including the Tarell, Cafanell, and the rivulets in the Llangorse area. These latter, together with the other tributaries mentioned, except those for the compensation reservoir, form the sources of supply for the proposed great Llangorse reservoir, which would also include the upper waters of the Llyfni, a tributary of the Wye. The capacity of the reservoir is estimated at 38,000 million gallons. Now, the chief engineer to the London County Council has estimated that he could supply London daily with 182 million gallons from the watershed of the Usk and Llangorse. This is only a part of his scheme, but it is the principal part, and is the life and soul of the Council's proposal. The river Thames is stated to be incapable of supplying anything like 180 million gallons per day, and yet we are asked to believe that these miserable little rivulets flowing into the Usk are capable of doing so. The united forces of all of them above Brecknock, or about one-half of the Usk and Llangorse watershed proposed to be captured, has produced a fine available river 3 in. in depth by 2 ft. 9 in. in width—a sort of Thames in miniature. And even these 3 in. are regarded obliquely by the local canal company, which, as already stated, are authorised to take all except this. The canal has not got enough water, and this phase of the subject is seriously engaging the attention of the Brecknock Corporation. When the London County Council's scheme was first reviewed by us we threw doubts on the statistics as to water available, and we see no reason to modify those observations. We are in favour of abandoning the Thames when a wholesome (non-peaty) and sufficient supply can be found elsewhere, but not before, and the Welsh scheme certainly does not improve on acquaintance. The statistics before us clearly show that both the Usk and Llangorse reservoirs would have to hold enough water to provide against at least a four months drought, both for compensation and ordinary supply.

The Centenary of the Electric Current.

THE lecture on "The Centenary of the Electric Current," given last Monday to the British Association by Dr. Fleming, was of great scientific interest. He showed how Signor Marconi's system of wireless telegraphy was the outcome of the work of Clerk Maxwell and Hertz, and how the latter were indebted to Volta for his discovery of the electric current. The demonstrations given by wireless telegraphy were very striking, but, apart from these, the summary the lecturer gave of the problems which the electric current presents to physicists gave a living interest to a somewhat abstruse subject. After a hundred years' study, physicists had come to the conclusion that when a current starts in a wire it produces an electro-magnetic wave, which extends into space with the velocity of light. When the current arrives at its steady value the ether round the wire is in a state of tension, cylindrical layers of ether tending to contract in the direction of the magnetic lines of force, and to expand at right angles to them. When the current ceases, the ether suddenly expands, falling back from the conductor, and restoring to the wire as it falls the energy it absorbed from the current during its rise. It follows from this that an alternating current in a wire produces waves in the ether which only differ from light waves in the time of their vibration. Hence Professor Fleming concluded "that the actions we call an electric current, if alternated rapidly enough in direction, would end by producing a ray of light." In attempting, however, to specify more particularly the motional changes in the ether which are required to produce the observed effects, we are at present in the region of conjecture. The aim of physical enquiry at the present time is to devise a theory of the ether, from which with the fewest possible assumptions, could be deduced the facts of electricity, magnetism, and optics.

Building Activity at Berlin.

IT has been generally assumed that, after the rapid development and reconstruction of Berlin during the last ten years, there would be a lull in the building trade of that city; but, far from this being the case, there is, if anything, still greater activity as far as private enterprise is concerned. Everywhere we find buildings which have been erected as recently as the seventies being pulled down to make place for the palatial constructions which appear to be more in accordance with the modern requirements of the Berlin business world. The stucco façades of the seventies are rapidly disappearing, and nearly everywhere freestone or brickfacing is now being used. In these new buildings the academic Renaissance treatment formerly adopted also appears to be a matter of the past, and even the older firms of architects are adapting themselves to the modern taste for somewhat freer designs. What applies to the City thoroughfares also applies to the residential part, and the Thiergarten district shows numerous villas which, both in plan and architectural treatment, are far above what we used to see in the German capital, say, five years back. It may be observed that a German business man, directly he has made some money, buys his own freehold in the city and holds his own business premises, and then buys another freehold outside the central area for his "villa." The wealthy classes, too, seem to find nothing too costly as far as these private residences are concerned, and we only recently had an opportunity of inspecting about a dozen of these villas, for the most part built by the same firm of architects, the cost of which varied between 25,000*l.* and 50,000*l.*, whilst two of them cost over 100,000*l.*, and one had a dining-room which alone cost 23,000*l.* This hobby for "bricks and mortar," combined with a certain genuine interest in architecture as an art, is to be found in most business men in Berlin, and is probably the cause of that rapid evolution of the German capital which is making it one of the handsomest cities of the world.

Tyne Harbour Piers.

TROUBLE has persistently followed these structures ever since their commencement. No doubt their position is one where wintry storms are of exceptional violence, but we believe it is not incorrect to say that tempestuous weather is not so much to be blamed as original constructional deficiencies. For these the designer was not at fault, but rather the authorities, who insisted

on spoiling the adequate scheme proposed. From time to time the north pier has been damaged by the scour of the sea; massive stones have been loosened and used by the waves much as battering-rams were formerly employed by mankind, and more than once the pier has been entirely broken through. Consequently, as often happens when counsels of false economy prevail, the present generation is compelled to pay for the sins of the past. There is reason to hope that the defensive measures now adopted will prove successful, but we regret to learn, from the last report of Mr. Walker, the engineer to the River Tyne Commissioners, that the condition of the south pier is highly unsatisfactory. In consequence of severe weather during last winter, the foundations are partly undermined, massive foreshore blocks have been displaced, and the pier may not improbably give way if storms, such as were experienced last winter, recur during the ensuing season. Divers have been occupied in clearing away displaced material, preparatory to the commencement of under-pinning, and a new 40-ton crane has been placed in position for dealing with materials. A large number of 40-ton concrete blocks are in readiness for fixing at the base of the wall, and a wave-breaking mound is to be built on the southern side of the pier, for the better protection of its foundations. At Tynemouth, cranes have evinced an undesirable predilection for diving from the pier into the sea, and it is to be sincerely hoped that South Shields may be more fortunate in its experience with the recently-erected apparatus. As regards the safety of the pier itself, much now depends on the prevalence of moderate weather during the next few months.

Conduits for Steam and other Pipes.

MANY large hospitals and other public institutions built during recent years are provided with subways giving ample and excellent accommodation for steam, condense, hot and cold water pipes. There are, however, numerous smaller buildings where, for some reason, very often of a pecuniary nature, the architect is compelled to run pipes from one block to another, in underground trenches formed in brickwork. This form of construction, as is well known, is not entirely free from objection when applied to the purpose mentioned, and it may be useful to call attention to the suitability of sewer-pipe for conduit work of the kind. This material has been adopted with advantage at many places in the United States. The heating system at the Craig Colony for Epileptics at Sonyea, New York, is run in sewer pipes where scattered buildings are served, but the pipes used are of the ordinary kind. More recently vitrified pipes with longitudinal joints have been employed, having lugs at distances of 10 ft. apart, carrying transverse shafts on which cast-iron rollers are fitted for the purpose of permitting free expansion and contraction of the contained steam pipes. Examples of the latter adaptation are to be found at the Vanderbilt University and in connection with the Union Station heating plant, Nashville. As it is possible for air and water-tight joints to be made, the internal pipes are protected from oxidising influences, and in the case of steam and hot-water pipes loss of heat by radiation must be considerably reduced.

Conway Tubular Bridge.

ONE of the cherished privileges of the average newspaper reader is a profound belief in the infallibility of his own particular organ. When, as occasionally happens, ideas of disordered character appear in print, the victim of such misplaced confidence is apt to attribute want of comprehension to some temporary failure of his own brain rather than to the proper cause. As an example we may mention a chaotic paragraph, likely to produce tortional stress in the minds of non-professional readers, which appeared this week in a well-known Northern daily paper. Referring to recent operations on the Conway railway bridge, the journal in question propounds the interesting theory that this "tubular bridge has had to be strengthened by the erection of two supporting piers, *and is now no longer a suspension bridge*, but a continuous girder bridge." It is gratifying to be assured that the bridge really is of the continuous girder type, though knowledge of the fact that it always has been so somewhat removes the charm of novelty. There is a suspension bridge at Conway, which, of course, has no connexion with the tubular girder bridge erected by Stephenson. The latter structure, as also the Britannia bridge, was originally designed so that the tube might be partly supported by chains passing over the abutment towers, but it was demonstrated by Sir (then Mr.) William Fairbairn that the tube might readily be made of sufficient rigidity, and no auxiliary means of support were applied. As an example of a great tubular girder, the bridge at Conway is less imposing, but not less interesting, than that over the Menai Straits. Between the abutments the distance spanned is about 400 ft., and the section of tube originally adopted provided strength so far in excess of actual requirements, that the bridge has been in successful use ever since its completion more than fifty years ago. Even now, notwithstanding the greatly increased weight of rolling stock, no alterations to the girder itself are considered necessary, although additional support is being afforded near the abutments. This work, which will very shortly be completed, consists in the placing of two cylindrical piers under the girder at a distance of 45 ft. from each end. Thus, as a matter of fact, the span is diminished only by 90 ft., and no practical interference is caused to navigation of the river. One effect produced by the imposition of additional weight upon a girder naturally is a slight increase of deflection, and the ends must consequently deviate to a corresponding degree from the horizontal. By diminishing the central span rigidity is increased, and necessary adjustments are simplified, both at the fixed and at the free end of the girder. It is satisfactory to find that the durability of the bridge anticipated by its designers has been fully realised; also that the present modification is of unobtrusive character, and in no way calculated to destroy the distinctive features of the structure.

Sanitary Condition of Hackney.

THE most important points in Dr. King Warry's Report to the authorities of Hackney on the sanitary condition of the parish are those referring to the water supply and ever-recurring subject of the condition of the River Lea. In regard to the water supply the Report comments on the new awakened anxiety of the East London Water Company for the establishment of house cisterns:—

"It is said that the provision of house cisterns is necessary for 'unavoidable temporary intermissions of the supply occurring during the repair of mains, &c.' This appears not to have been discovered by the company until the year 1895, although the district has had the constant supply since the year 1888. But as a matter of fact, the inconvenience arising from the repair of mains, &c., does not usually last more than a few hours; and if it did continue longer, would not be met by the provision of a cistern, neither would the much greater inconvenience and danger to health caused by the total withdrawal of the water supply by the water company for small leakages discovered in the communication pipes, be removed by the same means; for it is not suggested that the contemplated cistern shall hold more than one day's supply; and again, we have no evidence in the Health Department that any complaints have been made of inconvenience suffered during the necessary repair of mains. It would appear as though the water company contemplated the annual summer recurrence of their failure to maintain the constant supply, and this by the association of ideas has convinced them of the necessity for cisterns for the minor interruptions produced by repairs, &c., of the mains. If it is intended annually to revert to the intermittent service, some means of storage with its obvious disadvantages will have to be provided; but if the constant service is maintained, cisterns except for flushing the water-closets and the supply of the hot-water service, are unnecessary."

In connexion with this subject, there is a curious episode in regard to the sale of 50,000 to 60,000 gallons daily to the company by a paint-manufacturing firm, whose cistern for this water was situated on the floor in a corner of a workroom where a number of people were engaged in manufacturing pigments, some of them containing matters injurious to health. Dr. Warry remarks:—

"This incident impresses one with the feeling of great insecurity with regard to the supervision and control of our water supplies. The Water Company evidently did not regard the statutory duty of giving notice to the Local Government Board before resorting to any new source of supply with that seriousness which the Board attach to it or which the subject deserves."

The statistics as to the polluted condition of the river Lea seem to become worse and worse annually—yet nothing is done.

The Pneumatic Dispatch Tunnel.

OUR readers may recall that in (or about) 1869 a company was established for carrying mails and parcels to Euston terminus from the General Post Office in St. Martin's-le-Grand through a tunnel beneath Holborn, New Oxford-street, Tottenham Court-road, Hampstead-road, and Drummond-street, with an engine-house between High Holborn and Whetstone-park, at the rear of the Soane Museum. The tunnel was constructed by Mr. John Aird of cast-iron ∩-shaped sections, measuring 4 ft. by 4 ft. 6 in., at a cost of 175,000*l.* Though the engine-power employed amounted to 800 horse-power, it was found practically impossible to force the train of cars through the tube, by reason of leakage of air and other obstacles. Four years ago Mr. George Threlfall, consulting engineer, assisted by Mr. George Neill, began to make a survey of the works with a view to adapting them for the purposes of an electrical train, carrying nine tons in each of four or five cars at a rate of about thirty miles an hour, and fitting a smaller pneumatic tube within the roof for blowing "late" letters to Euston in less than two minutes. It is stated that Sir W. H. Preece

and Professor Carus-Wilson, with other leading electrical engineers, are satisfied that the project can be accomplished, and that Professor Carus-Wilson has prepared plans and specifications for the electrical train and for lighting it with incandescent lamps.

THE BRITISH ASSOCIATION MEETING.

ALTHOUGH the Dover meeting of the British Association has not been without unpleasant incidents, the gathering as a whole has been successful, and productive of several communications of a high order. The time has gone by when scientists wait for the meeting of the Association to announce any interesting discoveries they may have made, but this year there seem certainly to have been some exceptions to this rule. The picnic element, it is true, was there as usual, and was to some extent intensified by the reception of the French Association and the return visit, but that can be overlooked. The arrangements at Dover on the landing of the visitors were grossly mismanaged, if, indeed, there were any arrangements at all. There was considerable discontent amongst the British members at the selection of comparatively a few for the journey to Boulogne, and there have been letters to the Press respecting the accommodation in Dover. Those who have had any experience of the way the French invite and conduct parties of scientists to places of interest in France know perfectly well that the selection process is not a new invention. The French like to know how many people are coming, and provide for them accordingly; they do not send out a general invitation, and trust to the weather as to how many will arrive. Those who are left out in the cold may seem aggrieved, but they have really no case. Nobody will deny the right of the host to select his own guests, though this elementary fact does not seem to have been considered by certain members of the Association assembled at Dover.

The sectional meetings were well attended, as usual, and more of the international element was present than is generally the case. On Friday, the 15th inst., the Mathematical and Physical Science section were interested by the president's address, in which he enlarged on the advantages of the proposed National Physical Laboratory at Kew. Professor Poynting was a little discursive to begin with, but he made out a strong case for physics. We notice, with regret, that he did not emphasise the importance of the laboratory from the architects' and engineers' standpoint, for, in our view, the advantages to be gained in this direction are quite as interesting as the furthering of abstract science. The "mechanical constitution of the universe," another topic touched upon, might very well have been left to the astronomer and chemist, for although mechanics were brought in to illustrate certain points, the problem is essentially foreign to the physicist. Presumably the mathematical elements of the case were the chief apologies for its introduction. The "limitations of physical method" were also defined. This method was developed in the study of matter which we describe as non-living, and with non-living matter the method has sufficed for the purpose of the physicist; but as Sir George Stokes remarked in the discussion, it was very important to distinguish between the physical and the biological method.

Dr. Horace Brown opened the Chemistry section by discussing "The Assimilation of Carbon by the Higher Plants." The Geological section under the presidentship of Sir Archibald Geikie, was disappointed in not hearing the president's address, which was held over for the benefit of the French visitors who came later on. But Mr. R. Etheridge read a paper on the Dover and Franco-Belgian coal basins. It would have been better, perhaps, had Mr. Etheridge confined his attention to the recent discoveries of coal in Kent, for, surely, the main question has already been thrashed threadbare. Professor Boyd Dawkins followed with a paper on the "South Eastern Coalfield." The first boring he noticed was at Ropersole, between Dover and Canterbury, and he was of opinion that the coal measures at that point were a portion of the same series as those at Dover. There, as at Dover, the question of seams of coal resolved itself, probably, into a question of sinking deeper. Only two unimportant seams had been met with in a thickness of 197 ft. At Dover twelve seams were penetrated in a thickness of 1,054 ft. 6 in., the thickest, 4 ft. seam, being at the bottom. The Ropersole boring established the fact that the Dover coal measures extended northwards for a distance of eight miles, and beyond, in the direction of Canterbury. The coal measures set in in Kent at a sufficient distance to the north-east of Brabourne to allow of the presence of the carboniferous limestone and millstone grit. These probably dip at the same high angle as the Devonian below. Their south-western boundary could only be accurately defined by further borings, such as those which were now being carried on at Ottinge, about two and a half miles north-east of the scarp of the Downs and six miles to the south-west of Ropersole. Their range to the north and east still remained to be proved. They were, however, continued under the Channel, and had been proved by the boring at Calais in 1850, as well as those carried out in 1898 at Strouannes, near Wissant. In this district they were clearly shown by other borings to be faulted into the Devonian and other pre-coal measure rocks.

Professor Dawkins said that the southern boundary of the Kent coalfield, though as yet ill-defined, was marked by the Pembroke-Mendip anticline, ranging under the southern scarp of the chalk downs. To our mind, however, this anticline is very inconclusive, for, although coal has never been proved to the south of the Mendip anticline in Somerset, there is the strongest probability of its being there. If we go as far to the east (namely, into Belgium) as Professor Dawkins does to the west, we shall find no difficulty in discovering a disturbance of similar character to that at the Mendips, and coal is yet found to the south. The paper was right in urging caution, but we think sufficient importance has not yet been attached to the problematical occurrence of coal in South Somerset, and too much has been based on what is known to occur in the reversed seams north of the Mendips. We have a right to conclude that similar conditions probably obtain under Kent, North Sussex, and South Surrey as obtain in South Wales, Somersetshire, in South and Eastern Belgium and Westphalia, for the phenomena are unquestionably due to the same mountain-making disturbances. As we have remarked on a former occasion, the circumstance that certain borings in the south and east of England have ended in beds normally found underneath the coal measures does not prove that coal is not there, for along the same line of strike in Belgium the Cambrian are bored through to meet the coal measures, and in Somerset the coal seams pushed up against the northern flank of the Mendips are inverted, and may be passed through more than once in a deep shaft. The chief value of Professor Dawkins' paper rests with the authoritative fact that coal is found at Ropersole as well as at Dover. Mr. Walcot Gibson read a paper on some recent work amongst the upper carboniferous beds of North Staffordshire, and its bearings on concealed coalfields. The conclusion he reached was that a thorough and complete examination of the exposed coalfields of the Midland counties and of the bordering New Red rocks would be of the highest importance in determining at what depth the productive measures lie beneath the great central tracts of the Midland counties. The president remarked that Mr. Gibson had thrown more light than had been shed for many years past upon the doubtful measures above the coal measures and near the Permian beds; and, secondly, he had shown that workable coalfields extended far beyond their present worked limits. Not only had Mr. Gibson thus extended the coalfield in North Staffordshire, but he had shown that it could be worked much nearer the surface than had hitherto been supposed possible.

The president of the Geography section, Sir John Murray, selected the "Ocean's Floor" as his subject. No man living knows more about it, and, apart from its purely scientific aspect, the study of the ocean's floor is of considerable commercial value in connexion with the laying of submarine cables. The survey of new cable routes yields every year a large amount of accurate knowledge as to the life and deposits in the sea. The main theme of the discourse, however, was the proposed exploration of the Antarctic continent. Admiral Makaroff, of the Russian Navy, recounted an Arctic voyage in the Russian icebreaker *Yermak*.

Sir W. H. White, president of the section of Mechanical Science, delivered an address on "Steam Navigation at High Speeds." He alluded to the constantly growing difficulties in the way of still further increase of speed. The services to be performed by steamships differ in character, and demand the production of many distinct types of ships and propelling apparatus. Stated broadly, the task set upon the naval architect in the design of any steamship is to fulfil certain conditions of speed in a ship which shall not merely carry fuel sufficient to traverse a specified distance at that speed, but which shall carry a specified load on a limited draught of water. The size and speed of warships were discussed at length, and showed the progress made in recent years. The steam turbo-motor introduced by Mr. Charles Parsons, the president remarked, reduces the weights of machinery, shafting, and propellers greatly below the weight required in the quickest running engines of the reciprocating type, owing to its very high rate of revolution. Sir George King, addressing the section of Botany, alluded at length to the importance of preserving type specimens, though we should have thought that the necessity was apparent to even a beginner in the science. The president was more at home when dealing with the forest department of India. He stated that the men who took a leading part in moulding the department were all botanists, and to most people it would appear fitting that the possession of a knowledge of and liking for botany should form a strong characteristic of officers whose main duties were to be in the forest. This principle did not now appear to guide the department. The ordinary forest officer educated in England now arrives in India without sufficient knowledge to enable him to recognise from their botanical characters the most well-marked Indian trees. To tell such an officer the name of the natural family to which a plant belongs conveys no information to him whatever, for he knows nothing of botanical affinities. We venture to think that the cause of this state of things is twofold. On the one hand, we have the student at the Forest School at Cooper's Hill anxious to pass his examination as high as possible with the minimum amount of labour; and on the other, the knowledge of the Indian Government that botanists, as such, generally have no liking for the practical aspects of their science. In reference to the last, experience has shown that the Government must have, as far as possible, men who combine a certain amount of scientific training with some knowledge of forestry from the commercial aspect. The man who studies pure botany alone is of no use to the Indian Government—at least, that is our view. The president remarked that the general decadence of the teaching of systematic botany in England during the past twenty years is perhaps to some extent the cause of the low estimation in which the science is held by the authorities of the Indian Forest Department.

On Friday the Mathematical Section listened to the report of the committee on "Electrolysis and Electro-Chemistry," presented by Mr. W. C. D. Whetham. The report stated that the conductivity of a number of salts in very dilute aqueous solution at the freezing point of water has been determined by Mr. Whetham, whilst Mr. Griffiths had concurrently made observations on the freezing point for corresponding solutions. The observations of conductivity extended to solutions of sulphuric acid, potassium chloride, sodium chloride, barium chloride, copper sulphate, potassium permanganate, potassium bichromate, and potassium ferricyanide. Professor Lodge read the report of the Committee on the "Heat of Combination of Metals in the Formation of Alloys." The experiments have been carried out by Dr. A. Galt in order to determine whether the heat produced by the solution of an alloy of copper and zinc in nitric acid is the same as would be produced by the solution of the same amount of copper and zinc mixed, but not alloyed. The results show that the heat of combination of zinc and copper is negative when much zinc is present, and becomes a negative maximum for 16 per cent. of copper. With greater percentages of copper the heat of combination becomes zero, and then positive, reaching a maximum positive value for 38 per cent. of copper. It then sinks to zero, reaching that value for 90 per cent. of copper. In the discussion, Mr Vernon Harcourt thought that great caution

was necessary in making deductions from observations of this nature, because the products of decomposition of the acid used might be different, according as the alloys or the mixed metals are used. The section was much interested in a paper by Mr. C. E. S. Phillips on the "Production in Rarefied Gases of Luminous Rings in Rotation about Lines of Magnetic Force." The apparatus used consisted of an approximately spherical glass bulb, the ends of which were left open for the purpose of inserting two soft iron electrodes, ½-in. in diameter, through air-tight flanges, which themselves were cemented to the glass. The bulb was about 2½ in. in diameter, and the electrodes were chosen of a sufficient length to enable them, whilst almost meeting at the centre of the bulb, to project outwards slightly beyond the rims of the flanges. A side tube was attached for the purpose of connecting the apparatus to a Sprengel air-pump and McLeod vacuum gauge. Two powerful electro-magnets were then adjusted so as to strongly magnetise the electrodes when necessary. A low pressure having been produced in the bulb by the action of the air-pump, leading wires were attached to the iron electrodes to enable the discharge from the secondary of an induction coil to be passed through the rarefied gas. Under these conditions the effects produced in the usual glow-discharges by the magnetisation of the electrodes could be conveniently examined. The interest in these experiments lies in the fact that they seem to indicate the existence of freely-charged atoms (ions) in a gas which has been subjected to electric discharges, the charges being negative.

An important report was read in the Chemistry Section by Professor Clowes on the "Intermittent Bacterial Treatment of Raw Sewage in Coke Beds." This process was at first experimentally carried out by the London County Council for the treatment of the effluent from chemically-treated sewage, but is now applied to raw sewage screened through coarse gratings. Coke of the size of walnuts is used, and beds from 4 ft. to 13 ft. deep have been tried. One treatment on the coke beds removes all the fæcal matter and 50 per cent. of the dissolved organic matter, whilst a second treatment removes a further 20 per cent. of the dissolved organic matter. The mode of procedure is to leave the sewage in contact with the coke for three hours, and then allow the coke to stand empty for seven hours, for æration. Professor Clowes stated that the effluent supports the life of fish, and neither it nor the coke becomes foul, although no bacterial improvement is brought about by the treatment—a factor that is advantageous for the final stages of purification. The efficiency of the filters falls off in time, owing to the clogging of the cellulose fibres derived from wood pavements, straw, &c., but much of this can be removed by a preliminary sedimentation, and disposed of in a destructor. Fresh coke requires five or six weeks to get into working order; in dry weather, when the sewage is less dilute, the working is less satisfactory. This paper was followed by one by Mr. W. Scott-Moncrieff on "The Place of Nitrates in the Biolysis of Sewage," which was not remarkable for its originality. In the discussion on the sewage question, Mr. Dibdin stated that the bacterial treatment was a success. The important feature of Professor Clowes' communication was the successful treatment of the sludge, which in London amounts to 40,000 tons a week, and costs a considerable sum to take out to sea. He remarked that the sewage of Leeds had been successfully treated on the coke beds, although it contained a large proportion of chemical refuse. Mr. Douglas Archibald raised a point as to whether the bacterial treatment of sewage would be as efficient as the chemical treatment in destroying dangerous organisms. We can hardly appreciate this point, but on the principle of setting a thief to catch another thief, the bacterial method certainly has much to recommend it. By the chemical treatment you may boil the bacteria in sulphuric acid, and not only not kill many of them, but, provided you give them food they will propagate under your very eyes.

The work of the section of geology was confined to a series of entertainments enlivened by the aid of the optical lantern. At the ninth hour, when every other working body of geologists had recognised the value of photographs as showing what destructive elements can do in the way of sculpturing rocks and making scenery, the British Association comes forward with a few lantern slides. It was not so long ago that this method of imparting instruction was absolutely tabooed, though to-day it appears to occupy an important place in the Association's geological curriculum. "Water Zones and their Influence on the Situation and Growth of Concretions" was a theme dealt with by Dr. G. Abbott. He remarked that some geologists held the theory that concretions were due to the presence of organic remains, and apparently claimed that some centre was necessary for their formation. He cannot, however, have been much in touch with geologists, as distinguished from amateurs, or he would never have written his paper. Another uninteresting communication was by Mr. Edward Greenby, who discussed the nature of the sandstone pipes in the eastern part of the island of Anglesey. This was followed by two papers by men who had either not seen a glacier or had studied it to no purpose. Professor Sollas could find nothing more novel than the "Origin of Flint"; but Dr. Johnston-Lavis was enabled to throw some light on the origin of spherical calcareous bodies, which nobody has ever thought it worth while to write about.

The Mechanical Science Section was enlightened by Sir Charles Hartley, who wrote on the antiquity of the Suez Canal. The next paper was a kind of advertisement for the Parson's Steam Turbine Engine, already alluded to. Mr. Mark Robinson read a paper on the "Niclausse Steam Boiler." This consists of a number of tubes fitted with inner tubes for circulation on the well-known Field principle. The arrangement is such, however, that the tubes can be removed and replaced with great facility. In the discussion the author stated that one of the chief advantages of the boiler was that the tubes, being placed in an approximately horizontal position, the ends are not subjected to the greatest radiant heat of the fire, and are, therefore, not subject to be rapidly burnt away.

On Saturday Professor J. J. Thomson gave an account of recent research on the "Existence of Masses Smaller than Atoms." He pointed out that several lines of investigation lead to a determination of the ratio of the mass of an atom to the electric charge conveyed by it. These are (1) ordinary electrolysis, (2) experiments on the velocity of charged particles, (3) experiments on the velocity of cathode discharges. The results of these experiments indicate that the charge carried by an atom in cathode discharges and similar phenomena is apparently one thousand times greater than in ordinary electrolysis. It follows either that the atoms become dissociated, and only a portion of their mass carries the negative charges of cathode rays, or else that the atom can receive a greater charge than is assigned to it in explaining electrolytic phenomena; either the mass is smaller or the charge greater than in the case of electrolysis.

Sir Archibald Geikie gave his presidential address on "Geological Time." This had evidently been evoked by the recent restrictions placed by physicists on the age of the earth. The subject is worn out, however, and the president was not able to offer any new facts.

On Monday the Mathematical Section was presented the report of the Seismological Committee. Professor Milne remarked that the shiverings of our world recur on the average every thirty minutes, but the heavy breathing, or true ground swell, does not happen more than once a week.

In the Geography Section Sir John Murray read a paper by himself, and Mr. F. P. Pullar on the "Bathymetrical Survey of the Scottish Fresh-water Lochs." The chief practical point in the communication was the discovery that certain lakes supported more organic life than others. The shallow lochs supported more life than the deeper ones. In the deep lakes the temperature remains constant nearly the whole year round, and there is generally an absence of organic life, whilst the shallow lakes abound with life. In connexion with this an important point arose. The Glasgow water supply was taken from Loch Katrine, a deep loch, and there is now a proposal to let the waters of Loch Achray into Loch Katrine. Loch Achray being a shallow loch is full of organic life, and Sir John Murray thought it would be well to reconsider the proposal. This communication is full of interest, but the authors do not state the nature of the "organic life." That is omnipresent, and what we want to know is, how far it is inimical to health? Scares of this kind are gratuitous in the present state of our knowledge. There can be no question, however, as to the value of the work accomplished by the authors; the only pity is that it is not undertaken by public rather than by private enterprise. Sir John Farquharson discussed the work of the Ordnance Survey during the past twelve years. By way of comparison, several foreign maps were provided, so that members might have an opportunity of seeing what was done abroad. Colonel Duncan Johnston, the Director-General of the Survey, said that arrangements had already been made to push forward as rapidly as possible the revised 1-in. map with hill sheets. For the present, owing to want of space, the Department is tied as to the amount of work they can do; but new buildings are to be provided, and in a few years the work will be done more expeditiously. With regard to pushing on the 4-mile map and the 10-mile map, the drawing of the former is now completed, and the engraving will be entered upon as rapidly as possible. The Director said that during the last few years there had been a great many changes in the Ordnance Survey, and these had conduced to make work slower.

In the Mechanical Science Section Mr. A. Siemens contributed a paper on "Electrical Machinery on Board Ship." After referring to some early means of driving electrical machines, he said that in view of the contention that English practice was lagging behind that of other countries, it would be well to remember that at the Chicago Exhibition the two or three direct-driven sets of electric generators were almost ridiculed by the American engineers, who confidently predicted that the old country would soon drop this practice and adopt the American method of belt-driving. So far from this prediction being fulfilled, direct driving was now as much in use in the United States as in Great Britain, or elsewhere. He was of the opinion that the type of generating plant now in use on board ship had reached a stage of development which would be improved, but not materially altered.

In the same section Professor Barrett and Mr. W. Brown read a paper adding to our knowledge concerning the electric conductivity and magnetic properties of an extensive series of alloys of iron, of the highest value to electrical engineers and physicists. Professor Hudson Beare, the recorder of the section is also making physical tests of the alloys. Mr. Wilfred S. Boult described a method of electric railway signalling without contact which he has devised, and which has been tried experimentally on the Great Northern Railway. Magnets on the road deflect a pivoted needle so as to close a local circuit on the engine. The needle is mounted in the middle of an armature, which, as it passes near the road magnets, collects the magnetism and condenses or focusses it on the needle. If the road magnets are placed with their north poles to the right side of the line they will deflect the needle to the right side also; if the polarity be reversed, the needle will go to the left. Each movement may close a different circuit for giving the appropriate signal.

In the section of Anthropology several communications were made, including one by Professor Flinders Petrie on "Sequences of Prehistoric Remains," alluded to in another column.

Amongst the papers read in the Botany section was one by Mr. A. C. Seward, who discussed the "Jurassic Flora of Britain." One would have thought that this had better been presented to the Geology section.

On Tuesday the Mathematical section discussed thermometry, the subject being introduced by Professor Callendar, who suggested the adoption of the variation of resistance with temperature of a definite piece of platinum as as a provisional standard of reference for all platinum thermometers. The British Association Electrical Standards Committee has led the way in the past in the adoption of standards, and Professor Callendar proposed that, in view of the increasing commercial use of platinum thermometers, a platinum-thermometer standard should be adopted, in terms of which all other thermometers of a similar kind should be compared; just as electrical resistances were formerly compared with the British Association standard ohm. Professor Threlfall described a gravity balance invented by Professor Pollock and himself, by which they sought to determine the changes in the value of gravity due to the moon's attraction.

Amongst other papers read in the Chemistry section was one by Colonel J. Waterhouse, on "The Action of Light upon Metallic Silver." He stated that when cut masks were laid on the surface of silver leaf or foil, or on a Daguerreotype plate and exposed to the sun's rays, a visible image ultimately appears on the metallic surface. The effect is produced more rapidly if the metallic surface has been exposed to mercury vapour, or immersed in an acid solution of a ferrous salt mixed with nitrate of silver. Copper and probably other metals are sensitive in the same way.

In the Geology section Professor Boyd Dawkins read a paper on "The Geological Condition of a Tunnel Under the Straits of Dover." There was nothing new in it, though a large audience assembled. Mr. F. W. Harmer read a paper on a proposed new classification of the older and newer Pliocene deposits of the East of England, which was sadly out of date as far as the main palæontological basis is concerned.

The Mechanical Science section was interested in a contribution by Mr. J. L. Thornycroft on "Recent Experiences with Steam on Common Roads."

There was little left to be done on Wednesday, the last day of the meeting. In the Mathematical section Dr. Bauer communicated an account of recent magnetic work in the United States and Alaska. The Geology section listened to a theoretical paper by Mrs. Maria M. Gordon on "Sigmoidal Curves in the Crust of the Earth." The usual final congratulations to the various presidents were expressed, and the meetings came to a close.

INSTITUTE OF PUBLIC HEALTH AT BLACKPOOL.

THE Congress of the Royal Institute of Public Health at Blackpool opened on Thursday, when the President for the occasion, the Marquis of Lorne, read his opening address. In commencing his address he said:—"It is not my fault that I am here posing as a medical student. I have been mesmerised by the new medical powers which are being so rapidly developed among our scientific men. One of these is the power by which persons who know nothing whatever of the subject matter in hand are compelled by what is called Public Life—a terrible form of bacteriological parasite—to appear as what they are not. I have obeyed the irresistible impulse communicated to me mainly because compulsion has been said by a leader I follow to be a blessed word. I am not so sure about the blessings, but I am certain of the compulsion."

A large portion of the address was occupied with a review of the situation in regard to matters of purely medical jurisprudence which are not within our province. In touching on the subject of pure water and the pollution of rivers, the President said:—"At this season of the year, when holiday and other folk are able to enjoy themselves by the sea, and everybody expects us at Blackpool to have all the amusements and necessities of life provided for the sum of sixpence, we talk health. We try to lay in a store of it to serve us through the coming autumn and during the winter months of the following year. We overhaul our M.P.s, and ask them why they have not individually brought in Bills, that would, of course, have immediately passed under the acclamation of Government and Opposition alike, to purify this, that, and the other. The thing is so simple. Meanwhile, Governments of both Parties appoint commission after commission. These commissions go smelling about, abusing everybody and everything, and the general result is a crop of new inspectors and a grand rush at the M.P. to get a sanitary appointment. As the number of persons increases, as the smoke of factories increases, as the pollution of rivers and harbours increases, it becomes more and more necessary to have a good milk and water policy. Sir W. Preece has lately spoken of Moses with great admiration, evidently considering him as the first great President of sanitary congresses, and as quite an exceptional sanitary inspector. He certainly had advantages which Mr. Chaplin does not possess. He was able to punish in a manner that would lose any modern minister his seat in the House of Commons. Fancy Moses allowing a man to call himself a conscientious objector! Why, Moses would have cut him off from among the people in five minutes; and Moses would have been quite right to do so. He was also able to get pure water in a manner denied to Mr. Chaplin. If an Exodus were always easy Blackpool, which, in spite of its insalubrious name, is one of the most excellent health resorts in the world, providing refreshment alike for mind and body, we should not have to speak so constantly of our self-made grievances in the towns. But the Exodus season is a good one to seek for the promulgation of new health regulations. Of these we must agitate, and make the agitation a hardy annual for less smoke and purer drains. Who can voyage in a steam launch down the Manchester Canal, the Mersey, or the Clyde without using all the bad language the necessary holding of his own nose will allow him? I once saw a November wind carry the hat of a Mayor of Salford into the effluent of the Salford sewage into the Manchester Canal. I felt inclined to bless that wind as one giving a chief magistrate the chief lesson he should learn. Would that all Mayors and Lord Provosts' hats could be blown off in the right place at the right time to get the crime of conveying sewage into much-used streams well into their heads! But to blame mayors is to blame the people who make mayors. It is like the old abuse of kings for making war. The people made the kings, so that the blame bestowed on the individual is misplaced energy. Some cities are moving in this matter. Experiments have been made with sewage farms. These have been found not to pay so well as was expected, and so they will probably be rarely worked. Glasgow has begun to get rid of her sewage by conveying it to a distance. Her Clyde is still a standing, or, rather, flowing, disgrace to the chief commercial city in Scotland, but we are all proud of her, as she has a forcible character, and save on her river, lives in the odour of sanctity. Her municipality shines in electric excellence on land, and it is only on the home waters that she stinks in men's nostrils. On the waters afar she has a great name and a clean record. They treat the sewage of the eastern district of the city with lime and alumina as precipitants. The fuel for the machinery is the coke of the filter beds when it becomes dirty and has to be renewed. Ten millions of gallons of sewage can be dealt with each day, equal to about one-fifth of the whole municipal area.

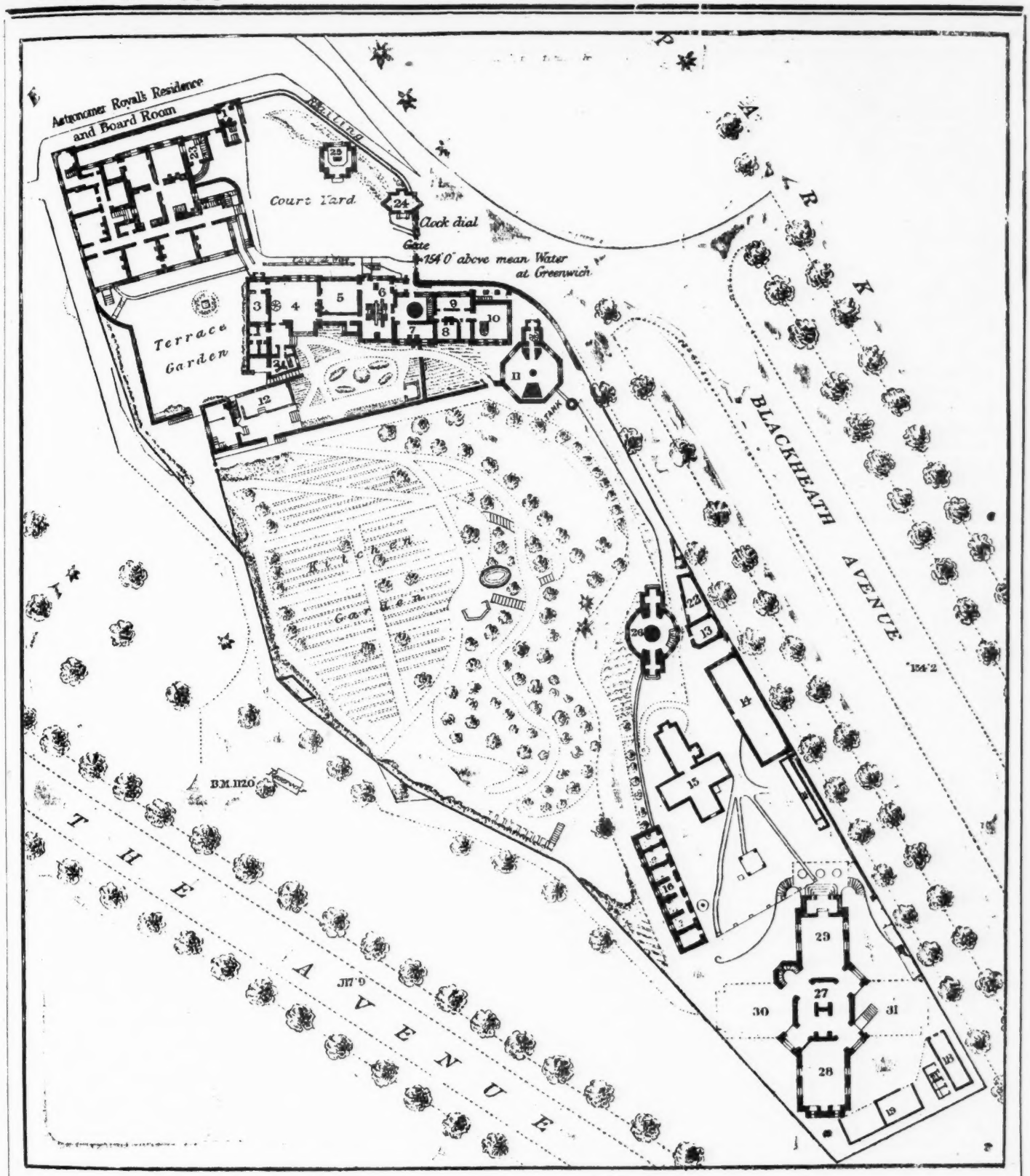
In London lime and sulphate of iron are the precipitating media. More has been done in the Thames Valley to keep the river pure than for any of our great streams. I remember well that in the late '60's and early '70's the smell from the Thames was most disagreeable in the Committee Rooms of the House of Commons. This has all been changed, and no one can now complain. Very different is it if the worker be on the banks of the Irwell, Tyne, or Clyde! It may be remarked in regard to the immense progress made in supplying large cities with good drinking and general purpose water that the absence of lime in the water has led in some instances to the opinion that where possible the effects of such absence should be recognised as harmful, and met by any means possible. For the purposes of street washing, it may be observed that many seaside towns still habitually use sea water, Brighton having only lately discarded its use. Here, again, the necessity of cleanliness is brought before us, for sea water in bays and places where the tide has no scour may be too unwholesome for street use. Salt water does not dissolve nearly so rapidly as does fresh water the evil in things thrown into it. The bad stuff remains long undissolved a little only below the surface, poisoning the air when thrown by low tide or men's actions upon the land."

SCHOOL BUILDING, BOTTWNOG, CARNARVONSHIRE.—The new intermediate school building at Bottwnog was opened on the 13th inst. The building has been erected, on the site of the old Bishop Rowland's endowed school, at a cost of nearly 1,500*l*. The architect was Mr. Rowland Lloyd Jones, of Carnarvon; and the builder was Mr. Griffith Griffiths, of Tydweiliog. The school will accommodate about seventy-five children, and consists of a central hall, boys' and girls' departments, a dairy and cooking class-rooms, and physical and chemical laboratories.

LIBRARY BUILDING, HAWARDEN.—A new building for St. Deiniol's Library is to be erected at Hawarden as a part of the national memorial to the late Mr. Gladstone. The building has been designed by Messrs. Douglas & Minshull, of Chester.

ST. DUNSTAN'S, STEPNEY: HISTORICAL NOTES.

A FACULTY has been issued from the Consistory Court to authorise certain improvements and alterations—including re-seating and removal of the galleries—which it is proposed to carry out forthwith, at an estimated cost of about 3,500*l*. Towards that sum subscriptions amounting to 2,500*l*. are promised, the Mercers' and Vintners' Companies contributing 250*l*. and 25 guineas, respectively. The architects are, we are informed, Messrs. J. E. K. & J. P. Cutts, and Messrs. Dove Bros. are the contractors. The church was rebuilt in the middle of the fifteenth century, the former structure having been erected, says Matthew Paris, by St. Dunstan in 952, and dedicated to him after his death and canonisation, in place of the earlier church of All Saints. Hatton (1708) records that a west porch, after the Tuscan order, was added in 1612, and the fabric repaired and beautified in 1685. In the north porch is a bas-relief of the Virgin, "with her Almighty Infant in her arms," and a female figure in an attitude of supplication; a rude carving of the Crucifixion is above the south door. The fabric is of stone and flint, mostly in the Perpendicular style, with a low buttressed tower and embattled parapet. A general reparation was made in 1847, under Benjamin Ferrey's superintendence. The church has many interesting associations; its graveyard, which covers six acres and was opened to the public in May, 1884, is noticed by Steele in both the *Spectator* and the *Tatler* for the number and oddity of the epitaphs, many of them being to sailors and sea-captains. Amongst the vicars of the original parish were John Colet, Dean of St. Paul's, founder (1512) of St. Paul's School; Richard Fox, Bishop of Winchester, who in 1516 founded Corpus Christi College, Oxford; William Jerome, burned at Smithfield in 1540, and Richard Pace, the friend, as was Colet, of Erasmus. The Colets lived at the "Great Place" on the west side of the church, where, and at the vicarage, More and Erasmus visited them. John Colet devised the house to the school as a residence in holiday-time for the high-master; it was afterwards converted into a popular resort as "Spring Gardens," and its site is now that of Spring Garden-place. Pace, who succeeded Colet at St. Paul's, and Sir Henry Colet (father of the Dean) were buried within the church; the latter's marble altar tomb beneath a groined canopy in the chancel was repaired by the Mercers' Company in 1605, and again in 1697. Amongst the numerous inscriptions and memorials we may cite those of Sir Thomas Spert (*obiit* 1541), Comptroller of the Navy, *temp.* Henry VIII., and founder and first Master of Trinity House, by whom the monument was set up eighty years after his death; Nicholas Gibson (1510) and his wife Avis, who founded the Coopers' Company's Free School at Ratcliffe, where Bishop Lancelot Andrewes had his first education; Jane Nevill, Lady Dethick; Admiral Sir John Berry (1689), and in the graveyard at the church's east end, his widow Rebecca (1696), who had married Thomas Elton, of Stratford-le-Bow. Her monument is commonly known, perhaps from the salmon hauriant and annulet of the Berry coat-arms, as the "Fish and Ring" monument; Dame Rebecca is reputedly the heroine of the ballad of "The Cruel Knight; or, Fortunate Farmer's Daughter;" compare, too, the old sign of the "Salmon and Ball," in Bethnal Green-road. The tale of burials includes those of Henry Stewart, Lord Darnley, elder brother of Mary Queen o' Scots' husband; Matthew Mead (1699, altar tomb in the churchyard, south side), who was ejected in 1662 from the living of Shadwell for non-conformity, and whose son, Dr. Richard Mead, began to practise in Stepney; Lady Anne Sheffield (1571); Admiral Sir John Leake, *temp.* Queen Anne; and the Rev. John Entinck (1773) lexicographer. The memorial, a figure of the Good Samaritan, erected to Benjamin Kenton, who died in 1800, leaving nearly 64,000*l*. in charitable bequests, is by Sir Richard Westmacott, R.A. The marriage registers, which Mr. T. Colyer-Fergusson is now editing and privately printing, record the marriage on April 25, 1587, of Elizabeth Acton and Stephen Gosson, the dramatist, and lecturer in the church; that of Edward, third Earl of Bedford (December 12, 1594), and Lucy, the patroness of Ben Jonson, Daniel, and Dr. Donne, daughter of Sir John—afterwards Lord—Harrington, cousin of the poet and author of "Whence comes my Love," who lived at Stepney as comptroller and treasurer



Plan of Greenwich Observatory Buildings.

of Henry VIII.'s camps and buildings; and that of Samuel Sowton (May 26, 1674), of St. Peter-le-Poore parish, to Anna, daughter of Sir William Rider, deputy master of Trinity House, to whom Pepys often refers in his diary. On one occasion Pepys dined with the Riders who lived in the house, at Bethnal Green, traditionally known as that of the Blind Beggar, but built, it is said, in 1570 by John Thorpe, for one John Kirby, and vulgarly known as "Kirby's Castle," or "Folly."

Stepney, or Stebun Heath, the Stibenhede of the Domesday survey, was formerly a manor of the Bishops of London, with a manor-house at Bethnal Green, extending from Stamford Hill to the Isle of Dogs, and comprising Clapton, Dalston, Hackney, Bethnal Green, Mile End, Limehouse, Shadwell, Wapping, and Poplar—that is, most of the since separated parishes included within the later Tower Hamlets. Some land on the West-heath between the church and Mile End Old Town was laid out for building by Lady Wentworth, under an Order in Council of March 21, 1672-3, after a survey made by Wren, to whose report, dated May 13, 1673, a plan is annexed.

It had already become a place of highly fashionable resort, counting amongst its inhabitants Isabel, Countess of Rutland, in the latter part of the sixteenth century; Sir Thomas Lake, Secretary of State, *temp.* James I.; Henry, first Marquis of Worcester, in the house, since occupied by Matthew Mead and his son, near the old vicarage; and Sir Henry Waleis, Mayor of London, at whose house, close by the church, Edward I. held a parliament in 1299. Of the old houses round about the church some illustrations, with details, are given in an article in the *Builder* of November 27, 1886.

PRIMITIVE METHODIST CHAPEL, NORTHAMPTON.—A new Primitive Methodist chapel was recently opened at St. James' End, Northampton. The building is situated at the junction of Sandhill-road and the Harleston-road. It is 63 ft. by 36 ft., and provides accommodation for 400 persons, exclusive of the galleries on both sides of the rostrum. The building was erected by Mr. William Heap, from the designs of Mr. H. H. Dyer.

PLAN OF GREENWICH OBSERVATORY BUILDINGS.

THIS plan, which we have been permitted to reproduce from an official plan of the Admiralty Department, shows the collection of buildings at present included in the domain of Greenwich Observatory.

Over the rooms marked 3 and 4 on the plan is the astrographic dome, erected in 1887. The pier next the circular stairs still carries the original transit instruments and circles. The rooms 3 and 4 themselves are respectively the safe room and computing room.

The new lodge, No. 24, was added in 1889-90.

No. 27 is the octagonal museum built in 1890, and forming the nucleus of the physical observatory.

No. 25 is the transit building, in the courtyard, built in 1891. This was the first application of twin semi-domes to accommodate transit instruments, in place of the traditional gaps in front and rear walls and shutter on the roof.

In 1892 was built the south wing and two lobbies (No. 28) to the physical observatory.

No. 26 is the universal transit circle built in 1893-4, an adaptation of the twin semi-dome principle; the twin domes being made circular on plan instead of square, and rotary motion added, so that transit observations can be made in any vertical plane.

In 1893-4 the north wing of the physical observatory (No. 29) was built, with its two lobbies, the central octagon being completed and the Lassell dome raised. The west and east wings, 30 and 31, were added in 1898-99.

The magnetic pavilion in the park was in construction from 1895 to 1899.

The buildings not mentioned above are as follows:—

1. Chronograph Room.
2. Altazimuth Dome.
5. Astronomer Royal's Official Room.
6. Transit Circle Room.
7. Assistants' Room.
8. Chief Assistant's Room. } Library over.
9. Computers' Room.
10. Record Rooms.
11. Chronometer Rooms and East Dome.
12. Greenhouse and Outbuildings.
13. Foreman of Works Office.
14. New Library.
15. Magnetic Observatory.
16. Offices.
17. Photoheliograph (on roof of south wing P.O.).
18. Depot for R.O. Publications.
19. Sheds.
21. W.C.s, Yard, &c.
22. Carpenters' Shop.
23. Winch Room for Time Ball.

THE ATHENÆUM CLUB ALTERATIONS.

IN reference to this subject we have received the following letter from Mr. Charles Barry:—

"SIR,—I have read in the number of the *Builder* for the 16th inst. Mr. Collcutt's statement and your notice on the same.

Permit me to say that Mr. Collcutt's statement is calculated to convey a wrong impression.

He says when he was originally consulted in June, 1898, he was unaware of my official position at the Athenæum Club, but he admits that he became aware of it "shortly afterwards"; surely then he should at once have communicated with me. He says he then was informed that I was "Honorary Architect to the Club." At this I am surprised, for as a matter of fact, the Secretary (and, I conclude, the committee) were aware that I never held such an office, but was duly appointed in 1881 as "Architect to the Club," and held my office on the same basis as the Secretary, *i.e.*, appointment by a general meeting.

He further says he was informed that I had not done any architectural work at the Club since 1887. This is, no doubt, true, as no such work has been done to the building since that date. Some modification, it is true, has been made in the drain system, as to which the committee consulted, some time ago, an expert who advised that iron pipes should be substituted for the ordinary terra-cotta pipes existing.

Elaborate painting decoration to some of the chief rooms has also been done, but as to this, Sir Alma Tadema and Sir Edward Poynter offered their gratuitous services and advice, which was not unnaturally accepted by the committee; and I felt that, under such able guidance, it would seem presumptuous in me to interfere.

The important alteration, structurally and architecturally, to the building now in progress is a very different affair.

Mr. Collcutt says he was also informed that the plans and designs made by me in 1887 (approved as they were by the then committee), had been paid for and abandoned. How incorrect this latter statement is, is shown by the fact of the recent memorial of twenty-six members of the Club, asking that my plans should be put in the library, for comparison with those of Mr. Collcutt, before any further proceedings. Had time permitted, I am assured that this memorial would have been signed by many more members.

Mr. Collcutt refers to my letter to him of April 18, 1899, and his reply. Of course, I could not write before, as I had no idea that he had been consulted until that date, and then only knew it by the issue of the Committee's Report, with his plans attached to it, and I received this as a member of the Club, as required by the by-laws.

CHARLES BARRY."

On the other hand, we have received an important statement from Mr. Colcutt which places the matter in a very different light, as far, at all events, as to his own action in regard to Mr. Barry. It now appears that when Mr. Collcutt found that Mr. Barry had prepared a design for the enlargement of the Club in 1887, he suggested to the Committee that he should either see or write to Mr. Barry on the subject

"The committee, however, told him that there was no occasion to do this, inasmuch as Mr. Barry had been paid for the work which he had done eleven years previously, and they said that, although during the previous ten years architectural alterations had been made to the Club, Mr. Barry had not been consulted about them, and he had made no formal protest on the subject to the committee."

It will be seen from Mr. Barry's letter above that his view of his position differs materially from that given to Mr. Collcutt by the Committee.

"The committee also stated that at the annual meeting of the Club in 1898 an independent member of the Club publicly put the question whether the committee felt bound to employ Mr. Barry as architect for the proposed alterations, and the reply made on behalf of the committee was that the committee felt themselves quite free in the matter. The committee further informed Mr. Collcutt that they themselves would deal with Mr. Barry should he feel aggrieved in the matter, and they stated in any event they preferred not to employ a member of the Club as architect for the proposed alterations.

After receiving the above communications from the Committee, Mr. Collcutt concurred with the Committee in thinking that there was no necessity for his communicating with Mr. Barry on the subject.

In abstaining from doing so, there was nothing either unprofessional or discourteous or unfitting.

The works carried out at the Club during the last ten years have been of an important character, comprising drainage, decoration, marble work in the hall and important external alteration, and which are distinctly within an architect's province.

If Mr. Barry had been employed upon these works so as to make it apparent that he was not merely a nominal or honorary architect to the club, but actually engaged by the committee to carry out an extensive alteration scheme, Mr. Collcutt would have felt it incumbent upon him, as a matter of courtesy, to inform Mr. Barry when he was consulted by the committee."

Under these circumstances it is evident that Mr. Barry has no real cause of complaint against Mr. Collcutt; the latter actually suggested communicating with him, but the Committee took it on themselves. The view which was conveyed to him as to Mr. Barry's purely honorary position does not tally at all, of course, with Mr. Barry's view. But it is clear that Mr. Collcutt, at all events, did not act in any way unfairly to him, and we hope that Mr. Barry may recognise this now that he is more fully aware of the facts.

Mr. Collcutt complains that we still imputed to him "discourtesy" in our comment on his statement last week. As a matter of fact we merely said that "some persons would have thought it more "courteous" &c., which is not quite the same thing, and we naturally thought that Mr. Collcutt, in sending his own statement, had given us his whole case, which we regarded as still open to comment. In view of the most important statements he now adds to it, as a matter of course we withdraw and apologise for every imputation of the kind. We have evidently been misled by imperfect information into doing him a serious injustice, a fact which no one can regret more than ourselves.

FIRE TESTS WITH DOORS.

THE British Fire Prevention Committee has decided to undertake a series of tests with all kinds of doors, as to resistance to the passage of fire, from the most ordinary four-panelled wooden door and the solid timber door, to armoured doors, iron doors, and the heavy doors used for safes.

No. 25 of their pamphlets records the result of tests on two doors, a wooden door covered with tinned steel plates, and an iron-framed and panelled door. The doors were obtained in the open market, the armoured door being fixed by its maker. The iron door was hung in a rebated frame; the armoured door was hung to fit closely against the face of the brick wall, and had a 3-in. overlap both at the sides and at the top as measured at the centre. Both doors opened inwards, *i.e.*, towards the fire.

The armoured door was obtained in the open market, and was 2 in. thick, and was said to be constructed of thicknesses of $\frac{7}{8}$ in. pine boards, planed, tongued, and grooved, and nailed together (diagonally) with wrot iron nails, driven flush and clinched on the other side.

The boards were completely covered with tinned steel sheets, 26 standard wire gauge, with welted joints, and screwed in the joints, the screws penetrating three-quarters of the thickness of door, and being 6 in. apart. All screws were covered by the welted joints, and not visible from without. All the fittings were of malleable iron.

In the iron door the frame consisted of a $2\frac{1}{2}$ in. angle iron $\frac{3}{8}$ in. thick. A wrot iron stop was carried all round the frame, and secured with iron screws. The door was made with a $\frac{1}{4}$ in. thick wrot iron plate, and on the inside, forming panels, wrot iron stiles, top, bottom, and middle rails, $\frac{1}{4}$ in. by 3 in., were screwed to the wrot iron plate. The door was fitted closely into the frame, and was hung thereto with wrot iron pivots.

The test consisted of an hour's fierce fire, increasing to a temperature of 2,000 deg. Fah., followed suddenly by the application of a stream of cold water for five minutes.

The wood door covered with tinned steel plates remained in position, but was much buckled and bulged, and the upper part gradually inclined inwards to a considerable extent, permitting the passage of flame. The first spurt of flame over the top of door was seen after five minutes.

The iron-framed and panelled door remained in position, but became red hot, buckled and warped considerably, together with its rebated frame. The upper corner on the lock side gradually inclined inwards to a considerable extent, permitting the passage of flame. The first spurt of flame between door and frame was seen after twenty minutes.

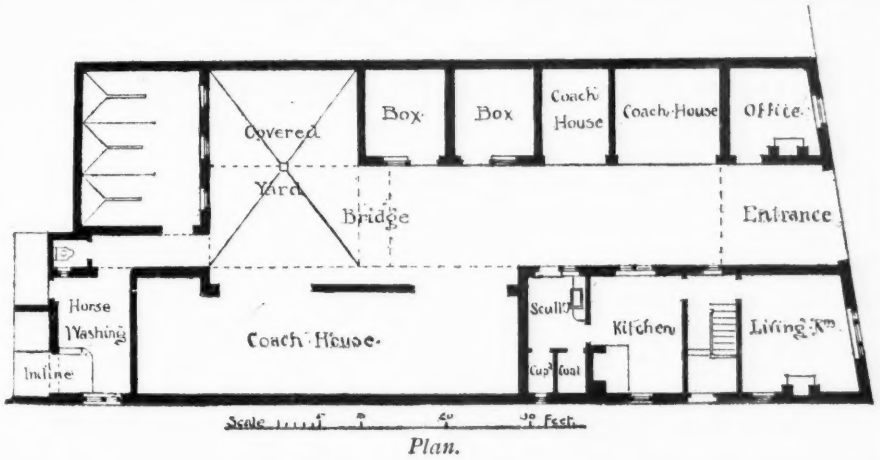
With the armoured door the smoke came through the joints of the plates in two or three minutes; in seven minutes spurts of flame came through the joints, and in thirteen minutes the flame was coming freely over the top of the door. After twenty-six minutes the door was considerably bulged on the side towards the fire, and was burning fiercely all over. After the test the top of the door had inclined towards the fire side to the extent of 6 in.

The iron door stood better, or at least longer. It was ten minutes before it was slightly twisted, or smoke came between the door and frame; after twenty minutes momentary sparks of flame came through between the door and frame at the top, on the lock side. After forty-nine minutes the door was red hot, but no flame came through except between the door and frame. It failed solely by twisting in its frame. It was therefore evidently in the main a better fire-resisting door than the armoured one. In the latter all the woodwork between the tinned steel plates, at the close of the test, had been reduced to charcoal and had fallen to pieces between the casing. The tin was melted off.

THE GUILD OF ART CRAFTSMEN.

THE Guild of Art Craftsmen is a small guild of men combined to place before the public objects of applied art direct from the hands of the artist craftsmen. Their first exhibition was held on Monday and Tuesday, announced by a pleasantly designed invitation card by Mr. G. M. Ellwood. The members are engaged in the production of "Art metalwork, silver ware, jewellery, carved ivory, furniture, enamelling, house decorations, &c." This is an inclusive list of applied arts and we wish the little guild every success in its venture. The co-operation of craftsmen is in itself a good thing, and the fact of the various branches of the work being done under one roof insures an artistic unity in the total result. Certainly nothing can be better for the art they serve or for the public who buys their work. Most of the exhibits are to be sent to the Arts and Crafts Exhibition, where they will be seen by a larger public than is possible at a private view. The work of Mr. Onslow Whiting comprises the best of the things on exhibition. This artist is known by his excellent metal work at previous exhibitions at the New Gallery. His treatment of electric light brackets are uncommonly graceful; the figure is introduced more naturally than is usually the case. Several bell-pulls, pushes, and fittings are noteworthy from the inspiration that has been seized from the common objects of natural history suitable for applica-

House and Stabling at Wimbledon Common. Mr. F. Forbes Glennie, architect.



Plan.

tion. There is also a fine plaque by this artist of St. George and the Dragon, and a panel inserted in an ornamental over fireplace, entitled "The Road to Camelot," a bold piece of work full of vigour and movement.

After the excellent black and white work of Mr. G. R. Ellwood it is disappointing to see his fireplace mentioned just now; it has heavy, meaningless features and is unpleasing as a whole. This and an octagonal table are a warning against the present tendency for novelty at any price. Novelty of itself cannot be pleasing, it must be the result of study and of using materials more correctly than they have ever been used before. It is a pleasure to turn to the enamelling of Mr. Benjamin Nelson, who shows a case of enamels of unusual size; the colouring is exquisite, such colours as the enameller alone can present to the eye. There are two figure subjects successfully treated, which, except for the borders, are very good, the designing, perhaps, has been allowed a secondary place to the colouring, a fault only too natural in this class of work.

We shall look, another year, for an exhibition showing steady improvement in the work done; and there can be no doubt that the Guild may meet the steadily increasing demand for art applied to the necessary objects of every-day life.

GRAMMAR SCHOOL, LICHFIELD. — At a recent meeting of the Conduit Lands Trust the Chairman of the Board of Governors of the Grammar School explained that the plans of Mr. T. H. Pyke, architect, of London, had been accepted for the erection of a new grammar school, on a site in Upper St. John-street.

HOUSE AND STABLING, WIMBLEDON COMMON.

THESE buildings are designed for a cab-yard, with house attached, to stand on a corner site, the house frontage looking on to the Common. Mr. F. Forbes Glennie is the architect. He writes—

"The accommodation is for thirteen horses, eight being in an upstairs stable over the long coachhouse, the others on the ground floor. The harness-room is placed over the three stalls, communicating direct with the big stable. The hay-loft comes over part of the covered yard and the first loose box, with access to the big stable by means of a trap. The house has upstairs four bedrooms. It is proposed to build the lower part in blue Staffordshire bricks, the upper part being stocks, flat pointed and white-washed."

If the building has not yet been carried out, we may suggest that the access to the stable, turning at right angles from a 4-ft. passage into the stable, is not direct or roomy enough. That the horse should have to be turned round at right angles before he is fairly clear of the door might cause difficulties. If the door must be in that position, both door and passage want another foot in width. In fact, stable doors ought to be 5 ft. wide in any case, but we admit that this is very seldom done.

COMPETITIONS.

WHARFEDALE ISOLATION HOSPITAL.—The time for sending in plans for this competition has been extended to October 1 next.

Illustrations.

DETAILS, PALAIS DE L'ELECTRICITÉ, PARIS EXHIBITION.

THIS illustration shows the decorative details of a portion of the front for the Electricity Pavilion for the Paris Exhibition, of which M. Hénard is the architect.

The building is not yet up; the illustration is photographed from the model or *maquette* of the work. It is characteristic of the trouble the French take over these things, that all the principal work for the Exhibition buildings is being modelled on a large scale previous to execution.

ST. PANCRAS PUBLIC BATHS AND WASH-HOUSES.

THESE baths, which are about to be erected upon an excellent site in Prince of Wales-road, Kentish Town, will comprise four swimming-baths, 130 slipper-baths, and a public wash-house for fifty washers. For these purposes the site, which has frontages to three good roads, is none too large, and has presented some difficulties in planning. The principal frontage is towards Prince of Wales-road.

The men's baths occupy the front portion of the site, the women's baths the rear portion, with the public wash-house in the centre. There are two entrances for men (first and second class) from Prince of Wales-road, with a pay-box between, and in Grafton-road there is one entrance for both classes of women bathers, and one entrance for the public wash-house on opposite sides of one pay-box. There are thus two pay-boxes only for the whole establishment. All the entrances are wide, and lead directly to the several departments, and corridors are thus avoided.

The men's first-class swimming bath will have a pond 100 ft. by 35 ft. in a hall 116 ft. by 50 ft., the depth of water ranging from 3 ft. 6 in. to 6 ft. 6 in. The gangways will be 4 ft. wide, paved with terrazzo, and finishing against pond with slate nosing 18 in. by 3 in. The paving will fall from the pond towards a channel running in front of the dressing boxes. This channel will be formed in the terrazzo, and will thus be without joints, and will be kept small and shallow, so as not to require a grating over it. The bath pond will be constructed with walls of brickwork in cement and a bottom of Portland cement concrete. The interior of this pond will then be lined throughout with cement and made perfectly watertight. After this has been ascertained by suf-

ficient testing, the walls will be lined with Balaam's patent white-glazed bricks, 9 in. by 4½ in. by 2¼ in., set on edge and laid tile fashion, and the bottom will be laid with terrazzo, which will turn up (with rounded internal angle) 6 in. against the walls. The use of terrazzo, which is cheaper than glazed bricks, will avoid the eyesore of curvilinear lines caused by the joints of the brick bottom as seen through the water. The pond walls will be decorated with light blue bands.

There will be a scum trough and overflow at the deep end of the bath, also spit boxes every 10 ft. on each side (of glazed fireclay), and a bright metal safety rail all round the bath, that at the shallow end also acting as a sparge pipe.

The dressing-box divisions and doors will be of yellow deal, the size of the boxes being 3 ft. 6 in. by 3 ft. The main posts will run up to the soffit of gallery (7 ft. 6 in. high), the framing being kept clear of floor and gallery soffit. The doors will be 6 ft. high, with wrought-iron grill over to prevent robbery. Each door will have a slam-lock or latch, which can only be opened by the attendant with his key. The seat will rest upon galvanised iron brackets, will be clear of walls and partitions, and will be easily removable. The floor will be paved with terrazzo, with a good fall to the channel in gangway already mentioned. These dressing-boxes will rest in gun-metal sockets in paving, and will be removed during the winter; they will not be *collapsible*. These boxes will be painted with a special enamel paint; all "planted on" mouldings will be avoided, and the general arrangement will be so that the whole can be easily cleaned down with the hose.

There will be a stepped gallery round all four sides of bath. This will be kept as narrow and low as possible, with highly stepped seats, so as to enable occupants of the gallery to see as much as possible of the bath pond. Two small spiral staircases will be provided to this gallery so that in times of pressure during the summer it can be used for bathers to dress in. These staircases will be closed off by iron gates during the winter, as required by the London County Council.

A douche room is provided near the entrance to the bath, having three douches, with hot and cold showers.

A diving stage, spring-board, and Professor Newman's patent water shute will also be provided, together with dressing table, mirror, and drinking fountain.

The walls of this hall will be lined internally with ivory-white glazed brick, with salt glazed brick dado.

In order to avoid the very unpleasant noise caused by the echo from the glass of the splashing of water, the central lantern skylight has been abandoned and an arched ceiling substituted, the central portion of which is solid, with the glass on each side. This will also improve the acoustic qualities of the hall when used for concerts and other entertainments.

Three club-rooms are provided in connexion with this bath, with a separate entrance from Willes-road.

As it is proposed to use this hall for concerts and other entertainments during the winter months, the "Theatre Regulations" of the London County Council have had to be followed. For this purpose the main entrance to the hall has been arranged at the south-eastern corner of the building, with a large vestibule 31 ft. by 16 ft., giving access both to hall and gallery. Three wide exit doors are provided to the hall on the ground-floor, and two exit staircases (leading to separate streets) from the gallery. The three club rooms already mentioned will be serviceable as artistes' rooms. When used for concert and entertainment purposes, this hall is completely cut off from the remainder of the building.

This hall will be warmed and ventilated upon the "Plenum" system. The principal air inlet (with suitable filtering and moistening arrangements) adjoins Willes-street, and the duct spaces under the gangways of bath will be the "Plenum" chamber and duct. The air will be blown through a steam heater by a powerful fan driven by an electric motor, and enter the hall through a number of openings (each about 12 in. by 12 in.) near the floor level. The outlets will be at ceiling line and through the roof. The supply of cold air only will in all probability be sufficient in the summer. The difficulty is to properly ventilate by artificial means a hall which will have one thousand occupants in the winter and only one hundred in summer. In order to prevent condensation while the hall is used as a swimming bath, a separate "Plenum" will be arranged on a smaller scale, by which warm air will be discharged from openings in the lower portion of the ceiling. This will not be required when the hall is used during the winter.

An overhead shower will be arranged from six sprays in the ceiling. This shower has a very pleasant and cooling and sweetening effect in the summer, when the bath is crowded.

The men's second-class swimming bath will have a pond 100 ft. by 35 ft., with a water depth of from 3 ft. 6 in. to 6 ft. 6 in. The construction and finishing of the bath pond will be similar to that in the first-class bath. The dressing boxes, 2 ft. 9 in. by 2 ft. 6 in., will have slate divisions 6 ft. 6 in. high, with yellow deal folding doors about 3 ft. 9 in. from floor to top, and standing 16 in. clear of floor, the actual height of the doors being thus 2 ft. 5 in. These folding doors will have specially-designed spring hinges, which will also form the stop. No fastenings will be necessary. Some of these boxes will be arranged in transeptal bays. Others will be of slightly larger size, capable of taking two or three boys at a time when there is a large number of bathers.

A room is provided near the entrance, and leading direct from the swimming-bath, in which are provided four douches or showers and a foot bath, the latter with a cold shower over it.

The other arrangements will be similar to the first-class bath, except that the general finishings will be less expensive.

The ladies' first-class swimming-bath has a pond 75 ft. by 25 ft., with water from 3 ft. 6 in. to 6 ft. deep. There will be a gallery at one end. A douche-room with two showers is provided, and also a dressing-room. The dressing-boxes are 3 ft. 6 in. by 3 ft. 6 in., and 7 ft. 6 in. high. A space will be provided where a tea-table can be placed. The other arrangements will be similar to those in the men's first-class bath.

The women's second-class swimming-bath has a pond 50 ft. by 20 ft., with water from 3 ft. 6 in. to 5 ft. 6 in. deep. All other arrangements will be similar to the ladies' first-class bath, except that there will be no gallery.

The slipper baths for both sexes and both classes will have practically the same arrangements, except that the first-class divisions will be of enamelled slate and the second-class of plain slate. The divisions will stand 2½ in. clear of the floor, and will be 6 ft. 6 in. high. They will stand upon and be coupled up with gun metal fittings. The capping will be in moulded teak. The doors will have gun-metal hinges and fastenings. The baths will be ordinary sized glazed fireclay uncased, and standing 3½ in. above the floor and upon glazed fireclay feet. A teak roll will be provided to the top edge of bath as being safer than the glazed roll. The hot, cold, and waste combination valves will be Busby's latest pattern to act from the outside. About one-fifth of these baths will be fitted with hot and cold showers, an extra charge being made for the same. A teak seat will be provided standing clear of partitions. In nearly all cases the slipper bath apartments have open roofs with lantern skylights. The floors will be paved with Terrazzo laid with falls to channels in the gangways. All supply and waste pipes to and from slipper baths will, in some cases, run in good-sized channels in the floor covered with chequered plates, and in other cases will run below the ceiling of the apartments below (this is the case of inferior rooms).

The public laundry is entered from Grafton-road, where the washers, after paying at the ticket office, wait at or pass through a large waiting hall to the washhouse. The cloak-room will be fitted with lockers, the key being kept by the attendant. A large crèche is provided. The public washhouse will have fifty washing compartments. Each compartment, which well be of galvanised iron throughout, comprises boiling tank, washing tank, and rinsing tank. Steam will be laid on to the boiling tank, and hot and cold water to the washer and rinser. The wastes discharge into floor channels which will also drain the floor.

There will be fifty drying horses arranged in two groups of twenty-five each, so that one group only can be used when the work is slack (at the beginning of the week usually). These will be heated and ventilated on the "plenum" system. There will be four 24 in. hydro extractors driven by water power.

The mangling-room adjoins the wash-house, from which it is only separated by a glazed partition (for easy supervision). There will be two power-driven mangles, the necessary folding tables and a small automatic gas apparatus for heating irons.

The establishment laundry is in the basement with a good direct light. It will contain a washing machine, two hydro extractors, and twenty drying horses, also a mangle. The towels in daily use will be kept here, and the laundry will be so worked that the whole of one day's dirty towels will be washed on the next day, thus preventing any accumulation of dirty towels.

The boiler-house will contain three Lancashire boilers, 30 ft. long, 7 ft. diameter. The coal stores adjoin the boiler-house. The engineer's workshop is near to these, also the engineers' mess-room. No mess-room is provided for the bath attendants, as it is preferable that they should take their meals outside.

The ventilation of the several departments has been fully considered. That of the men's first class swimming bath has already been described. Each of the other swimming baths will have an aspiratory fan in one gable, with fresh air inlets in suitable positions, also lantern skylights. Similar arrangements will be made in regard to the slipper baths and the public washhouse.

With the exception of the first-class swimming bath, all parts of the establishment will be warmed by means of low-pressure hot-water apparatus, radiators being chiefly used. In order to prevent condensation in the men's second-class swimming bath and those for women of both classes, hot-water pipes will be run along the walls a few feet below the springing of the roofs. The circulation of hot water for all these purposes will be from steam heaters in suitable positions.

A very large quantity of hot water is used in connexion with the slipper baths and laundries. This will be circulated from steam heaters and cylinders in positions close to the work to be done. This is in preference to circulating direct from one of the main boilers, so as to avoid incrustations in the latter.

The buildings throughout will be lighted by electricity supplied from the parish mains.

The water in the swimming baths will be warmed by means of steam injectors.

The swimming baths will be emptied by means of large cast-iron pipes running to the sewer independently of all other waste water drainage.

The several cold water, hot water, and steam supply pipes and wastes will be carried in the ducts surrounding the swimming ponds.

No steam engine will be provided. The fans, except where (as in the laundries) they are subject to moisture, will be driven by electric motors. All other machinery such as that in the laundries will be driven by hydraulic power under a pressure of 150 lbs. on the square inch. This arrangement will avoid the use of belting, which in the case of laundries is a source of danger.

The administrative arrangements may be briefly described. The Superintendent's office is close to the main entrance and the principal baths, and near to his residence, which is on the second floor, and also near to the committee room. The Matron's office adjoins the women's baths and public washhouse. An administrative corridor (well lighted) in the basement connects all departments, and has three staircases leading therefrom to the ground floor, thus providing complete intercommunication between all parts of the establishment.

A towel lift will rise from the basement into each pay office, and shoots for dirty towels will be provided from each swimming-bath and from each group of slipper baths down into the basement, so that no bath attendants need leave their own department, and no laundry men need come up to the ground floor. The moving about of trolleys will also, in the same manner, be strictly limited to the basement.

The whole of the principal departments will have internal facings of glazed brick. The doors and partitions will have no panel or other mouldings planted on. In order to avoid, as far as possible, the dirt which is brought into baths by bathers' boots, a large iron grating, about 5 ft. by 4 ft. will be placed immediately outside the doorway leading to each swimming bath, so that the dirt, or a portion of it, may be scraped off and fall below into a movable iron receptacle.

Two refreshment bars will be provided, one

for each sex, close to their respective entrances.

It is proposed eventually to sink a well, but, for the present, the company's water will be used. Storage is provided for 20,000 gallons.

The estimated cost is 57,500*l*. The architect is Mr. T. W. Aldwinckle, F.R.I.B.A.

Books.

Animals in Motion: An Electrophotographic Investigation of Consecutive Phases of Animal Progressive Movements. By EADWARD MUYBRIDGE. London: Chapman & Hall. 1899.

WE had the pleasure of being present, a good many years ago, at the afternoon lecture at the Royal Institution at which Mr. Muybridge first brought his remarkable experiments on photographing the movements of animals before English spectators; a lecture which was attended, we remember, by the Prince and Princess of Wales and their family, and by the late Lord Tennyson, among many other distinguished persons. We remember also the remark of a very eminent painter who was among the audience, to the effect that, however interesting the photographs, they would not be of much use to animal painters, because the eye could not take in the various positions of animal movement, but only their general effect, and it was this which the painter had to represent. We are reminded of the remark in looking at the large series of photographs reproduced on a small scale in this volume. Here and there we come on a striking and effective attitude of the horse, for instance, which has the advantage of suggesting new lines for the painter—something more characteristic than the average horse attitude in pictures; but on the other hand how many there are which, though of course absolutely true, no painter could venture to represent, for the reason that they are attitudes so momentary, in the course of passing from one position to another, that the eye can never capture them, and it is only through the camera that we come to know of their existence.

Yet we should not agree that the representation of these momentary attitudes is of no use to the artist. In representing the more normal attitudes, and those which impress themselves on the eye, the painter may surely be assisted by diagrams showing how and through what stages of movement the animal comes into that position. No doubt, also he may be assisted to escape from the domain of merely conventional attitudes which have been adopted by habit and tradition. And Mr. Muybridge argues that in regard to the gallop some of the ancient conventional attitudes in art were much nearer nature than our modern painters ever get. He divides pictures of the gallop into the Primitive, the Ancient, and the Modern. In the first, the animal is drawn with all its four legs flexed under it; in the ancient, the support is given by the two hind feet, the fore legs being flexed; while in the modern all four legs are stretched out, the hind ones with the soles of the feet turned upward. As the author observes, there is no photographed position in the gallop that in the least resembles this, and he thinks it is only from bad habit that people accept such a representation at all. The "Primitive" position does, however, actually occur, and the representation of this position in some ancient drawings of pre-civilised artists seems to show that they had looked more closely at a galloping horse, or other animal, than the modern painter has. It is a curious fact too, noted in connexion with this subject, that "an intelligent child, known to the author, who, having a taste for drawing, and happily not familiar with the conventional representation of the gallop, was asked to sketch her idea of a runaway horse which she had seen, produced a similar phase as her impression of the action." The "Ancient" method, in which the animal was apparently planted firmly on his hind legs with his forelegs in the air, producing no impression of speed, was apparently a kind of conventional representation accepted as that of a horse at full speed, but it certainly conveys no idea of speed to the eye. It will be remembered that this is also the attitude for a galloping horse with Velasquez, as well as with many of the Italian Renaissance painters. The "Modern" painter's gallop does convey the idea of speed, at all events, and some would say that is sufficient defence for it. But after Mr. Muybridge's photographs have become more popularised it will hardly be possible any longer to accept the modern painter's galloping horse. But what attitude we could accept, from those given by the camera, it would be difficult to say. Not one of them produces to the eye the idea of a gallop, except perhaps one or two of the doubled-up ones. It will lie with painters to select one or two of the attitudes which are most nearly consecutive, and from them combine an attitude which will match the impression produced by a gallop on the eye.

The book is at all events of the greatest interest, as a practical analysis and illustration of the problem of animal movement.

Library Administration. By JOHN MACFARLANE, of the British Museum Library. London: George Allen.

SINCE this book is one of a series, and the construction, architecture, and fittings of a library have been elsewhere dealt with, the author confines himself entirely to the discussion of details which concern the conduct and inner workings of such an institution. The architect will, therefore, not find himself in any sense specially informed, while the ordinary reader must not expect to find material other than sufficient to provide him with a general idea of the subject. Dr. Garnett, the editor of the series, is at pains to make this clear in the introduction which he has written to the volume. "Although," he says, "but a small proportion of Mr. Macfarlane's manual can claim to rank as a code, the whole of it will be found to possess much value as a disseminator of information, and as a stimulus to reflection." "So dissimilar," he adds, "are the extent, the characteristics, and the needs of libraries, that few rules of universal application can be given, and the attempt to deduce such from the practice of exceptional libraries can only end in disappointment."

There is evidently the greatest diversity of opinion both upon the subject of cataloguing and of arrangement. In America the former is carried out universally upon the card system, which works well so long as the library is but a small one, but becomes unwieldy as the books multiply. For a library of any importance, the author is of opinion, and Dr. Garnett herein supports him, that the bound-up catalogue form is indispensable, and experience of both systems leave us in no doubt that the latter is at least much the more convenient to the reader.

Then the arrangement of the books upon the shelves, either according to subject or according to size, is a matter which leaves something to be desired, whichever plan is followed, the end to be compassed in all cases being that the attendant may be able to secure any particular book in the least possible time, and that the books may be stocked with the least possible waste of space. It is, of course, an immense saving to the staff of a large library when the "open access system" is as far as may be adopted. In the reading-room of the British Museum there are some 20,000 books, so situated as to be accessible to the readers themselves. It is when dealing with the library of the British Museum, that the author is most communicative, and there is always a certain fascination in being taken "behind the scenes." The reader's ticket having been placed in one of the baskets which stand upon the horseshoe counter in the centre of the room, it is generally a matter for the exercise of patience until the book desired is brought to him. But others are meanwhile active on his behalf. These tickets are firstly marked with the time of application and are then sorted out into sections, and despatched to the attendants who preside over the various sections. Having found the book, the attendant substitutes for it a piece of cardboard upon which he writes the reader's name, the press-mark, the author's name, and title of the book. He also writes upon the ticket the number of the board, each attendant having a certain definite number of these boards provided him, for which he must account. The book is taken to the "section table" and is entered in a register, and is finally sent down to the reading-room and delivered to the applicant. The ticket is, of course, retained until the book is delivered up by the reader. A "book-railway" propelled by an electric motor runs along the various galleries upon which the books are stored, which travels at the very respectable speed of 500 ft. per minute. We have light also thrown upon the mysteries of press-marks, and the arrangement under the heads of "Academies" and "Periodical Publications," two features in cataloguing, which, though actually simplifying research, present a stumbling-block to the inexperienced. The systems employed in library management are of importance, but in order that a library shall entirely fulfil its ends, it is equally important that the librarian is one who readily and courteously places his special faculties and information at the disposal of the reader. The editor of this series will be ever remembered as having by this means doubled the advantages offered by the greatest library in the world.

Copenhagen. Published by the Danish Tourist Society, Copenhagen. London: Simpkin Marshall & Co.

THIS is a charmingly got up little book, or large pamphlet, of something over a hundred pages, with a decorative cover and a number of photograph illustrations of buildings, besides various well-designed decorative head pieces, &c. Though really a kind of guide-book, it is in literary manner and artistic form quite above the average guide-book level, being exceedingly well written and appealing to the best educated class of travellers. Those who are visiting Copenhagen for the first time should procure it.

Handbook of Saw-mill and Wood-Converting Machinery. By M. POWIS BALE, M.I.M.E., A.M.I.C.E. London: W. Rider & Son, Limited.

As the writer of several other works dealing with wood-working machinery, the author is already known to the public, and he possesses the additional advantage of practical acquaintance with his subject. The object of the handbook now under consideration is to embody, within reasonable limits of space, information of the kind which is always useful to those about to establish wood-working mills, and also to give some particulars as to the general construction and management of wood-working machinery. The matter seems to divide itself into two sections, although no such division is ostensibly made by the author.

In the first section several points are discussed which bear upon questions of site, the construction and arrangement of buildings, machine foundations, engine and boiler power, mill-gearing, the removal of chips, sawdust, &c., by exhaust fans, and provisions for protection from fire. This part of the book might with advantage be extended, and it would then be of proportionately more value to architects who may be commissioned to design wood-converting mills. Specifications which are given of an engine and a boiler might perhaps be omitted in favour of some more general advice with respect to such appliances, and, moreover, in such matters it is better for purchasers to be guided by one of the well-known Boiler Insurance Associations, than to try and judge for themselves with the help of specifications which they may not thoroughly understand. The remaining portion of the volume includes useful notes on all the better-known machines, and describes special machines used for oval, square, and octagonal turning, and for working pieces of irregular or eccentric forms.

Speeds are given for most of the machines, subject, of course, to modification according to circumstances, and we think if some indication as to power required were also stated, subject, of course, to similar reservations, it would be a desirable addition to this excellent book.

BUILDING TRADE IN THE POTTERIES.—Throughout the Potteries there is a firm tone in the building trade, and the amount of all kinds of property being erected is considerable. Bricklayers report employment as well up to the standard for the season; they have a small percentage out of employment. Joiners are busy, and there is a scarcity of operatives in the district. Painters and plumbers are busily engaged, and the former are working overtime in many instances. Plasterers and stonemasons are moderately employed. At Leek all branches of the trade are regularly employed. At Crewe business remains in the same animated condition that has been characteristic of late, full time being general. At Stafford a steady business is being done, and the operatives are regularly employed. Throughout the districts covered by this report in all the brick and tile yards there is great activity and very large orders on the books, both for local requirements and shipping purposes.—*Staffordshire Sentinel.*

The Student's Column.

ROADS: THEIR CONSTRUCTION AND MAINTENANCE.

PART III.—CONSTRUCTION.

13.—HISTORICAL.

THE history of road-making in this and other countries illustrates in an instructive manner the evolution of the modern road, and at the same time supplies an unanswerable refutation of the prevalent modern belief that we have made but indifferent progress in the practice, however much we may have improved upon the theory of road construction. It is usual for such critics to point to the perfection of Roman roads in support of this opinion. There are, however, obvious reasons for the apparent slowness of our improvement in this respect. It is only quite recently that our country roads have been placed under properly organised supervision, and the great development of road traffic, brought about by new methods of locomotion, has considerably raised the standard of our requirements. It must necessarily take a long time to remedy effectually the neglect and mistaken policy of former years; nor is it so easy to make satisfactory an old, badly-constructed roadway as it is to start a new road on a modern basis. Lastly, the question of the cost of the best material will continue for a long time to handicap those localities which are not geologically favoured with good supplies of natural stone.

In England, as in most other European countries, the earliest roads deserving of the name were the military roads constructed by the Romans. Some pre-Roman roads undoubtedly existed, such, for example, as the Southwark causeway, which was constructed across the marshy tract connecting Westminster with Clapham Rise; but these were of a very elementary nature and are scarcely comparable with the Roman roads. The above-mentioned causeway, for instance, was made in the simplest possible way, by driving piles into the mud of the marsh and filling in the interspaces with gravel or shingle.

The Roman roads were constructed, in the general way, as follows. Two parallel trenches were dug along the proposed direction, marking the width of the roadway. The soil was then excavated between the trenches until a solid substratum was reached, or, if necessary, piles were driven to secure a stable foundation. Upon this were placed several layers of material. The lowest layer consisted of large stones "not smaller than the hand could just grasp." Upon this layer was placed a bed of broken stone, 9 in. thick, and set in lime mortar. This, again, was covered with another layer, 6 in. in thickness, of mixed stones, broken brick, and pottery, also set in mortar, and over all was usually placed a kind of pavement of large stones, fitted together, and with the joints filled in by mortar.

This was a method of construction which would scarcely discredit a nineteenth century surveyor, and yet by such roads as these the Roman legions traversed every portion of their vast empire, carrying civilisation and enlightenment throughout Europe. On the decline of the Roman Empire barbarism, however, again usurped the land, and the Roman roads were abandoned to neglect and decay; except so far as the military exigencies of leaders like Charlemagne necessitated their temporary restoration.

In our own country in the Middle Ages, the condition of the roads was deplorable. There was, in fact, but little demand for them, owing to the scarcity of vehicular traffic, and the comparatively small amount of social intercourse under the feudal system. Even as late as the middle of last century, inland communication in England was difficult and in some cases even dangerous. Arthur Young, writing in 1770, has drawn a graphic picture of the state of the roads at that time. He speaks of ruts 4 ft. deep, and filled with mud even in the summer. About that time, a single stage coach travelled between London and Edinburgh, taking from twelve to fourteen days for the journey. In many parts of England wheel carriages were not used because they could not plough their way through the rough and uneven roads. Indeed, as late as 1818, it is stated that Bishop Buckner advised a newly-appointed curate of Waldron, in Sussex, to lose no time in going there, for in the course of a very short time he would find it impossible to do so. Of Sussex roads a writer in 1769 gives the following description:—"The roads in the winter season are the worst in England; for many of the prodigious trees which grow here, and are carried through this part of the country in the summer time to the Medway, on a carriage called a Tug, drawn by twenty oxen, advance so slowly that it is often several years before the tree reaches the place of its destination, for if ever the rain sets in, it stirs no more for that year, and often the summer is not dry enough to make the roads passable."

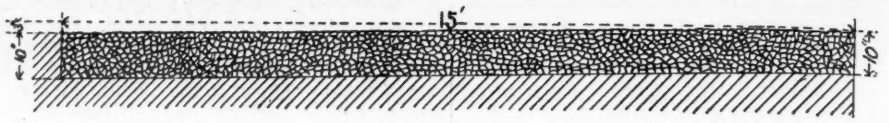


Fig. 1.—Section of Macadam Road.

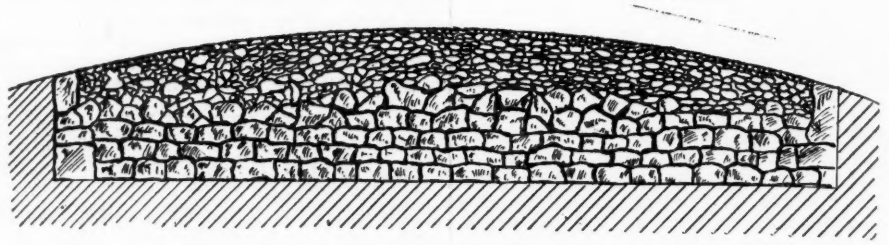


Fig. 2.—Section of French Road, 1770.

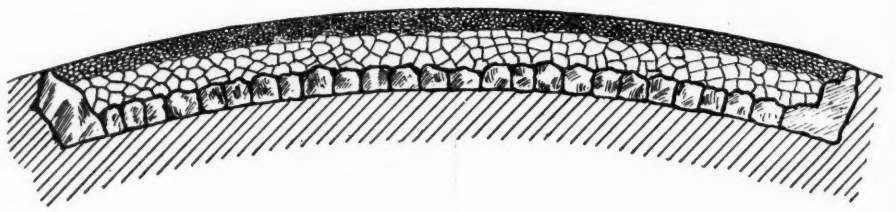


Fig. 3.—Section of Trésaguet's Road, France, 1775.

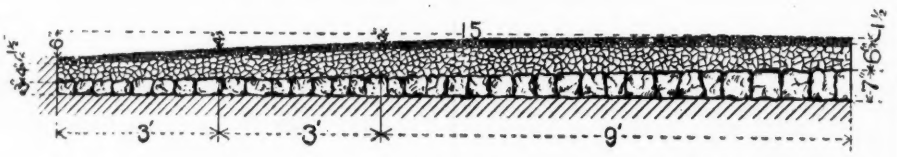


Fig. 4.—Section of Telford Road.

Not only in England, but also on the Continent, the same story is told. In France the country roads and even the streets of large towns were impassable in bad weather, and it was not until 1775 that a revival took place, again owing to military enterprise. Napoleon I., about this time, effected great improvements in the roads, not of France alone, but also of other countries through which he led his conquering armies. It was he who commenced in 1800, the construction of the famous road over the Simplon Pass, a work which took six years to complete. The improvement in road construction and maintenance thus inaugurated gave to French main roads a superiority over those of our own country, which was still further maintained by their superior system of control. The maintenance of the main roads of France was a national trust, effectually superintended by the engineers of the department of the Ponts et Chaussées; while in England road-making had not yet come to be considered as an object worthy of the application of engineering skill. About the middle of the last century the system of turnpike trusts was established by law in this country. By this system the roads were divided into short lengths of from fifteen to eighteen miles, and were placed under the control of trustees who were responsible for their proper maintenance, and were empowered to levy tolls for the expenses of their repair. The practical result of this system was that new roads were made and old roads were kept in some sort of repair by incompetent persons, utterly ignorant of the proper methods to be employed, or of the nature of the materials to be used. Many of the roads of this period were, in fact, little more than tracks, in which a certain amount of solidity was produced by filling in ruts and depressions with stones or gravel.

There is little wonder therefore that when John Metcalfe, about this time, turned his attention to road improvement, the principles which he advocated were eagerly taken up by many who realised the wretched state in which many of our roads were allowed to remain. Metcalfe's advice was sought far and wide, and not even the calamity of blindness, which overtook him at an early age, either damped his enthusiasm for improving English roads or weakened public confidence in the efficacy of his methods. Metcalfe was born in 1717, and Young wrote some fifty years later, so that the influence of his ideas had not made itself very widely felt even at the close of last century.

Coming now to the present century, we have a good picture of the condition of road engineering in 1809 from the Report of the Parliamentary Committee on Turnpikes and Highways. Without any prepared foundation, we read that materials were heaped on to the centre of the roadway until it was well barrelled, viz., a highly convex surface was produced, over which vehicles could only run with safety in the middle. When the convexity was at length worn down, it was restored by piling up fresh stones again on the central track covering a width of not more than 7 or 8 ft. By the compulsory confinement of the traffic to the middle of the road the latter was quickly worn into deep ruts, the loose stones and mud being pushed to the sides, until all the rainwater was effectually impounded in the middle. The convexity was then restored with any available rubbish, and the same process of disintegration and wear was repeated.

The large amount of convexity in the roads of this period was a fundamental mistake. Traffic should not be concentrated in one particular track, but evenly distributed over the whole width of the road. Surface drainage is better effected with a small fall on an even surface than with a greater fall on a road which has been ploughed into ruts.

It is noteworthy that in the same year, 1809, Mr. Foster, of Bedfordshire, advocated the desirability of first laying down a substantial foundation of the hardest stone, or coarsest gravel that could be procured, and then to coat with a finer and more level surface.

During these years Mr. James Loudon Macadam was giving his attention to the principles which had already been foreshadowed some years previously by John Metcalfe and others;

and, when appointed, in 1816, to the superintendence of the roads of Bristol, he was able to put those principles into practice, thus marking an epoch in the annals of road-making, and inaugurating the system which has ever since borne his name (see fig. 1).

Macadam's method is so well known that some apology is needed for the repetition here of the main points in his system, the fundamental principle of which consisted in the use of stone broken to such a size and shape that the fragments would unite by their own angles alone to form a solid surface. For this purpose small angular pieces were necessary, capable of forming an interlocked mosaic when compacted into the road, and of remaining firm under the pressure of traffic; whereas the rounded stones previously used were kept in such constant motion that they were worn away by attrition even before consolidation had taken place. His method of construction was equally simple. It consisted in substituting for the irregular loads of large stones, which had previously been heaped to a thickness of 2 or 3 ft. upon the middle portions of the road to maintain their marked convexity, a thin uniform coating, 11 in. in thickness, of stones broken to a uniform size, about 2 in. in diameter, carefully levelling the surface, and maintaining only such a degree of convexity as would ensure the ready drainage of surface water into the roadside channels. Instead of the former convexity of about 4 in. per yard, or $\frac{1}{18}$, he advocated only half this amount for new roads; so that, after thorough consolidation, it might be reduced to 1 in. per yard, a slope amply sufficient to ensure proper surface drainage.

Macadam's system possessed the merits both of efficiency and economy. The thick coatings of road stone which had previously been laid down served as quarries from which he procured his material, and which, after being broken to the required size he relaid in the manner described. His chief work at this time consisted in the improvement of old roads, the execrable condition of which afforded him ample scope.

In France, in the meantime, the engineers of the Ponts et Chaussées had not been idle. In 1774, Trésaguet had succeeded in effecting a notable improvement in the method of construction prevalent in that country. Instead of a thickness of road stone of 22 in. in the centre, diminishing to 16 in. at the side of the road (see fig. 2), he advocated a uniform thickness of 10 in. over the whole roadway. He excavated the road to the required depth, shaped the bottom to the same convexity as the finished surface was designed to possess, and placed upon it a rough hand-set pavement of large stones, laid on edge. Where the ground was soft he placed a layer of flat stones beneath the pavement. On the top of the pavement, successive layers of smaller stones were placed, and thoroughly pounded into a solid mass, in which all interstices were carefully filled in and all projecting angular points hammered off. Upon this was placed a layer of small stone, 3 in. thick, to form the final surface. Such was the mode of constructing the French "roads with foundation" up to about the year 1820 (see fig. 3). The excessive thickness of the road coating previously adopted in France was due to the fact that previous to 1764 the national roads were maintained by statute labour, and being on this account only attended to in spring and autumn, a long interval elapsed between the repairs, thus necessitating a thick layer of material to prevent them from wearing through in the interval.

Thus were inaugurated the two great systems of modern road-making, that of Macadam, in England, being without any specially-prepared foundation, and that of Trésaguet, in France, having a hand-set pavement beneath.

English engineers, as already stated, had not up to this time given much attention to road construction. It is true that Smeaton, in 1768, had undertaken the making of a new road across the Trent valley between Markham and Newark; but it was not until the early part of the present century that Telford commenced the work which has made his name famous in road engineering. His system was a modification of that of Trésaguet, combined with the application of the principles of Macadam. He excavated a trench of the width desired for the roadway, but retained the horizontal bed instead of rounding it to the convexity of the finished surface. Upon this bed a hand-set pavement was placed, consisting of stones, 9 in. deep in the centre and 5 in. deep at the margins. These stones were not more than 4 in. wide at the top, all the projections of the upper surface were broken off, and the interstices were well rammed with small stones. By this means a foundation was secured having the required convexity of 1 in 60. Upon this was placed a layer, 6 in. thick, of hard stone, broken so as to pass in all directions through a $2\frac{1}{2}$-in. ring. Upon the whole, when compact, was spread a layer, $1\frac{1}{2}$ in. thick, of good gravel (fig. 4.).

About the same time as this modification of the French system was introduced by Telford into this country, the French engineers adopted Macadam's method for all their roads without foundation, of which class the great majority of the roads in France then consisted.

In comparing the relative efficiency of Telford and Macadam roads it must be remembered that the essential difference between them lay in the adoption by Telford of a hard, unyielding foundation, whereas Macadam insisted upon the importance of a somewhat yielding or elastic bed of natural earth. He maintained that internal crushing, due to the weight of traffic, was diminished by this means. Opinions differ upon this point. Many engineers now favour the Telford system on the ground that elasticity is useless except on the surface; a yielding foundation implies motion, and consequently wear, in the lower parts of the road, whereas a firm pavement will confine the wear to the superficial portion, where it is easily repaired by the renewal of the material by which it is covered. It is also claimed that the substratal pavement of the Telford road provides for thorough drainage, and that it prevents clayey subsoils from working upwards into the road crust on the one hand, and on the other hand keeps the broken stone from work ing down into the subsoil.

It will be noticed, also, that Macadam was not in favour of the addition of any binding material, the close interlocking of the angular stones being supposed to be sufficient to produce solidity. In fact, he condemned the use of sand or gravel for this purpose, maintaining that such material defeated the very object in view by preventing the close contact and interlocking of the stones. It will presently be seen that this view is not now generally accepted; so that the original ideas advocated by this great pioneer of road construction have undergone considerable modifications in recent practice.

Paved Roads.—With regard to paved town roads, history shows the same progressive improvement. In the latter part of last century it was the custom to use boulder or cobble pavements, made from the large, rounded pebbles from the sea-shore. These still exist at the present time in many parts of our northern cities. Their disadvantages are obvious. Drainage is almost impossible, owing to the wide joints, between which filth accumulates and defies cleansing. Noise and jolting over the uneven surface are accompanied by a difficulty in traction which experiment shows to be nearly ten times as great as on a smooth asphalte surface.

These cobble pavements were succeeded by the use of irregular blocks of stone, from 6 in. to 8 in. wide, often undressed and so badly fitting that they came very imperfectly into contact and left wide, open joints between them. The base of support was very irregular, their size was wanting in uniformity, and their surface was often almost as uneven as the boulder pavement which they superseded.

Telford, in 1824, recommended that the paving stones should be dressed square on all sides to make a close joint, and that they should be laid in the form of an ashlar causeway upon a foundation, one foot in depth, made of broken stone. The stones which he employed were somewhat wider than those now adopted, but otherwise the main principles of construction of paved roads remains to this day very much the same as those of Telford.

Wood pavements are said to have originated in Russia, where red fir blocks, cut to the shape of hexagonal prisms, were used long before this class of pavement was adopted in this country. It was in 1838 that Stead patented the first wood block pavement, which was laid both in Manchester and in London. He adopted both hexagonal and circular blocks, but these did not prove equal in wearing qualities to the wedge shaped blocks introduced by Carey in 1839 and subsequently laid in many of the streets of the metropolis.

Asphalt was introduced into this country from France in 1836, primarily for foot pavements only. It was not until 1869 that the first street pavement in asphalt was laid in London, in Threadneedle-street.

GENERAL BUILDING NEWS.

ROMAN CATHOLIC CHAPEL, MOTHERWELL, LANARK.—The memorial stone of a Roman Catholic chapel which is being erected in Coursington-street, Motherwell, was laid on the 9th inst. The architects of the building are Messrs. Pugin & Pugin, of London.

CHURCH, WESTWOOD, NOTTINGHAM.—The new parish church of Selston, Westwood, has now been completed. The building is cruciform in plan. The nave measures 61 ft. by 31 ft., and the chancel 31 ft. by 16 ft. 6 in. It is proposed to add, at a future date, a tower and spire. Accommodation is provided for 356 persons. The walls are of local bricks, faced with Leicestershire sand-stock, with dressings of Matlock stone, the roofs being covered with Staffordshire brown tiles. Mr. P. H. Cary, of Derby, was the architect, and Mr. Wm. Salt, of Ripley, the builder.

ST. PAUL'S CHURCH, MARTON, LANCASHIRE.—It is proposed to pull down the existing church, and erect a much larger one on the site. The architect is Mr. R. Knill Freeman.

PRESBYTERIAN CHURCH, CUSHENDALL, CO. ANTRIM.—A new Presbyterian church is being erected at Cushendall, and the foundation-stone was laid on the 15th inst. The builder is Mr. Hugh M'Cann, of Ballymena, who will carry out the work from the designs of Mr. William J. Fennell, architect, Belfast.

NEW CHURCH, ABERDEEN.—The plans of a new church for the Free North Church congregation have been approved by the Free Presbytery of Aberdeen. The architect is Mr. W. E. Gould, Aberdeen. The site is on the west side of King-street, and immediately opposite Summerfield-terrace will be a tower and spire, containing clock with four dials, and rising to a height of 120 ft. above street level. The building will be in the Early English Gothic style of architecture, and the whole front of white Kemnay granite. Besides the church proper, there will be three halls, infants' class-rooms, kitchen for social meetings, lavatories, cloak-rooms, &c., and the aggregate cost will be about 8,000*l*. The church will have five exits.

WESLEYAN CHURCH, ULVERSTON, LANCASHIRE.—The foundation stones were laid recently of a new Wesleyan church in course of erection on a corner site in Neville-street, Ulverston. Mr. John Wills, of Derby and London, is the architect, and Mr. William Waite, of Ulverston, is the contractor.

SCHOOL BUILDING, ST. ELIZABETH'S ORPHANAGE, SALISBURY.—A new girls' school in connexion with this orphanage was opened recently. The architect was Mr. E. Doran Webb, and the contractor Mr. Edward Hale, of Salisbury.

THEATRE, RICHMOND, SURREY.—The new Theatre Royal which has been erected on a plot of land opening into the main road by the Green and Quadrant-road, was opened on the 14th inst. The centre façade of the building is of terra-cotta. The main doors open into a small vestibule, which leads into a larger vestibule measuring 22 ft. by 14 ft. The walls of these rooms are panelled with mahogany, and the floors are of marble. The main staircase, which faces the entrance doors, is of marble. To the left the stairs lead to the dress circle, through mahogany doors, whilst on the right is the entrance to the stalls by a corridor decorated in similar style to the entrance hall. The remainder of the ground floor is divided into pit stalls, of which there are six rows, and a pit with promenade space behind. At the back of the dress circle is a crush-room. Access can be gained from this room to the outside balconies, which are lighted by electricity. The top circle is divided into amphitheatre and gallery, both of which have separate entrances. The stage measures 34 ft. from back to front, 52 ft. across the full width, and 50 ft. in height to the grid. The width of the proscenium is 27 ft. The builders were Messrs. W. Johnson & Co., of Wandsworth Common. Mr. Frank Matcham was the architect, and the clerk of works was Mr. J. F. Revill.

SCOTTISH PROVIDENT INSURANCE BUILDINGS, BELFAST.—New buildings for the directors of the Scottish Provident Institution have been erected at the corner of Wellington-place and Donegall-square West. The available frontage towards Donegall-square exceeds 230 ft., of which the present building occupies 90 ft. It will ultimately form one wing of the completed block, which is designed with a central projection terminating in a lofty dome. The side wings will balance each other, and harmonise architecturally with the centre. A projecting columnar porch, two stories in height, placed on the angle, forms the entrance to the insurance office. Adjacent, but on the Wellington-place side, is the approach to the stone staircase and electric lift which afford access to the suites of offices on the first, second, third, and fourth floors. These are fireproof. Above these is a floor with caretaker's apartments, and store-rooms let in connexion with the shops and offices. In addition to insurance offices on the ground floor, which extend along Donegall-square, there are two shops. The Wellington-place

frontage also contains shops. All these shops have ceilings about 20 ft. high, carried on metal standards faced with Scandinavian red granite. Emphasis is given to the insurance offices by a special treatment of the masonry, which is in alternate courses of rusticated and fluted stone. The windows have boldly projecting pilasters carrying moulded arches. A system of steel and concrete construction has been carried out as far as possible throughout the building. All the lavatories, &c., are separated from the offices by tiled passages. The fittings of the offices of the Scottish Provident Institution have been designed by the architects for execution in teak wood. The general joinery is principally in yellow and pitch pine varnished. The marble mosaic terrazzo and wood-block flooring throughout the building have been supplied by Mr. J. F. Ebner through his agent, Mr. Shaw. Messrs. W. D. Henderson & Son have executed the wall-tiling. The marble work and the carving have been carried out by Messrs. Purdy & Millard. The electric fittings and the lift have been supplied by Messrs. W. T. Coates & Son. Messrs. J. Dowling & Son have done all the plumbing, and the copper flats. Messrs. Ewart & Son, London, have executed the ornamental copper work on cupola, &c. Messrs. Ward & Partners and Messrs. Riddel supplied the chimney-pieces of wood and marble. Messrs. Richard Patterson & Co. and Robert Patterson & Son supplied the hardware. All the offices and shops are heated and ventilated on the "plenum" system by Messrs. Musgrave & Co. The general contractor was Mr. Robert Corry. The architects are Messrs. Young & Mackenzie, of Donegall Square East, Belfast.

ROSEMOUNT VIADUCT BUILDINGS, ABERDEEN.—One of the largest blocks of buildings constructed in Aberdeen for a considerable time is now nearing completion in Rosemount Viaduct, where the Aberdeen Town and County Property Company, Limited, have erected shops and dwelling houses extending between Skene-terrace and Skene-street. The buildings are four stories in height, and consist of tenement houses above shops on the ground floor. The approximate cost of the buildings is between 13,000*l.* and 14,000*l.* Mr. George Hall is the builder, and Messrs. Brown & Watt the architects.

WORKSHOP, ALLOA ACADEMY.—A new workshop is being erected on a site at the south-east corner of the Academy playground, the frontage being to Ludgate. The building will contain benches for thirty pupils, and will be heated by hot water. The architect is Mr. R. A. Bryden, of Glasgow, and the contractors are, for mason work, Messrs. G. and R. Cousin; joinery, Mr. R. Cairns; plumbing, Mr. J. Philp; slating, Mr. R. M'Farlane; and plastering, Mr. J. Walker. Munn's patent ventilators are being fixed on the centre of the roof.

POLICE BUILDINGS, COVENTRY.—The new petty sessional court and police buildings in St. Mary's-street, were opened on the 14th inst. The architect was Mr. H. Quick.

MISSION HALL, LOZELLS, BIRMINGHAM.—The memorial stone of a new Mission Hall in Berner's-street, Lozells, in St. Paul's parish, Birmingham, was laid on the 16th inst. The building, when completed, is to have two stories. The ground floor will be divided into class and reading-rooms, while the mission-room proper will be above, and will be capable of accommodating about 450 persons. The building is being erected by Messrs. Harley & Sons, Smethwick, from the designs of Mr. Daniel Arkell.

WORKING MEN'S CLUB BUILDING, SCHOLES, YORKSHIRE.—A Working Men's Club building at Scholes was opened on the 16th inst. The architect is Mr. G. H. Birch, London.

TECHNICAL INSTITUTE, WAVERTREE.—This Institute was opened on the 15th inst. It was designed by Mr. Thomas Shelmerdine, City Surveyor, and has been built at a cost of 5,363*l.* On the ground floor are class-rooms for science and drawing, and a room fitted for classes in cookery and laundry work. In the rear, on the ground floor, is a workshop for the manual instruction centre. The first floor is devoted to an examination or lecture hall, capable of accommodating 200 people, and a room for art instruction.

HIGHER GRADE SCHOOL, IPSWICH.—The new higher grade school at Ipswich which was opened recently has a frontage to the Tower Ramparts of 148 ft., and comprises a main centre block, relieved by two gables, together with two slightly projecting wings, with similar gables. The material used is local red brick, and the façade is broken by cornices and string courses in moulded bricks, supplied by Messrs. Gunton, of Costessy, near Norwich. The wings project to a considerable distance in the rear, east and west, and between the two there is a central hall. There are double entrances at each end, for boys and girls respectively. The asphalted playgrounds, divided by a wall, are each 256 ft. long by 62 ft. in width. The dimensions of the central hall are 62 ft. by 44 ft., with a height of 26 ft. to the wall plate, and of nearly 40 ft. to the ceiling, which is of pitch pine; there is a dado of glazed bricks. On the north side are three class-rooms, shut off from the main hall when in use by movable partitions. Above these divisions a wide balcony has been constructed, upon which three other class-rooms open. The second floor is devoted to a row of class-rooms, and on the third floor are situated the physical and chemical laboratories and lecture-rooms. The architects were Messrs. J. S. Corder & Walter Brand.

LAUNDRY CENTRE, BEDMINSTER.—The laundry centre which the Bristol School Board have erected at Bedminster was opened on the 18th inst. The building stands on a portion of the playground of the South-street girls' school. The architect was Mr. W. V. Gough. Messrs. Bale & Westlake erected the building, the amount of their tender having been 470*l.*

BAPTIST CHURCH, MAIDSTONE.—It is proposed to build a new Baptist church at Maidstone, from the designs of Mr. A. Smith (Messrs. Ruck & Smith). The cost is estimated at about 2,500*l.*

THEATRE, BALHAM.—The Royal Duchess Theatre, Balham, was opened on the 18th inst. The architect of the building was Mr. W. G. R. Sprague, of Arundel-street, W.C. The theatre, which is situated in the High-road, has been erected at a cost of 35,000*l.*

CAR SHEDS, BOLTON.—The memorial stone was laid, on the 11th inst., of the new car sheds which the Bolton Corporation are erecting for use in connexion with the introduction of electricity as a motive power on the Bolton and suburban tramways. The structure now being erected is of one story, and is part of a scheme which includes the erection of offices and workshops to occupy the Bradshawgate front of the new buildings. The plans were prepared by Messrs. Bradshaw & Gass, of Bolton.

PRESBYTERIAN CHURCH, BANGOR, CO. DOWN.—This church has been erected at the corner of Prospect-road and Hamilton-road, and is 60 ft. wide and about 80 ft. long. At present only the ground floor of the church has been completed, and the structural part only of the gallery put in. The work has been carried out, according to the plans and under the supervision of Mr. W. J. W. Roome, by the following contractors:—Masons, Messrs. M'Laughlin & Harvey; structural steel work, Messrs. Richard Moreland & Sons, of London; glazing, Messrs. James Campbell & Co.; gas-fitting, Messrs. James Baxter & Sons, York-lane; and heating, Messrs. Crooks & Crozier.

CHURCH, BOOSBECK, YORKSHIRE.—A new church is being erected at Boosbeck from the designs of Mr. Hicks (Messrs. Hicks & Charlwood), architect, Newcastle.

CO-OPERATIVE PREMISES, INVERURIE, N.B.—New buildings have been erected by the Don Co-operative Society in North-street, Inverurie. Messrs. Bremner & Sutherland were the architects.

SANITARY AND ENGINEERING NEWS.

SEWERAGE SCHEME, UTTOXETER.—At a special meeting of the Urban Council, on the 11th inst., it was decided to adopt the recommendation of the Sanitary Committee to provide a scheme of sewerage for the town. The scheme is one of two formulated by Mr. Willcox, Sanitary Engineer of Birmingham, and the estimated cost is from 7,000*l.* to 8,000*l.* It is proposed to deal with the sewage by precipitation and filtration by the employment of coal.

PIER, HERNE BAY.—The new pier which has just been completed at Herne Bay is three-quarters of a mile in length, and extends into water sufficiently deep to allow steamers to call at all states of the tide. The structure is traversed throughout the greater part of its length by a car driven and lighted by electricity. A pavilion stands in the centre of the round pier-head. The pier was designed by Mr. Ewing Matheson, C.E., and erected by Messrs. Head, Wrightson, & Co., of Thornaby-on-Tees.

SEWERAGE WORKS, SHIPLEY. — The District Council of Shipley have been carrying out extensive sewerage works under the direction of Mr. Malcolm Paterson. The whole of Shipley proper and Saltaire had been thoroughly drained long ago, and little remained to be done to collect the sewage but to put in large intercepting sewers and to stop up the outfalls into the river and the Bradford Beck. This, however, was a very costly and difficult undertaking. The intercepting sewers almost entirely follow the courses of the river and the beck. The Windhill district had to be drained throughout, the system of drainage existing when Windhill was added to the area of the Shipley District Council being of the most primitive character. All this preliminary work has now been done, and simultaneously active operations have been going on at Dock Field in the construction of the necessary tanks and buildings for the reception and treatment of the sewage. The site of the works is an excellent one from the point of view of isolation. A tract of land extending over thirty-four acres has been acquired, and is steadily being prepared to receive the waste of the Shipley district, and to so treat it that nothing shall be left but dry sludge and a clear effluent. The land lies between the Leeds and Liverpool Canal and the river Aire, and extends from the junction of the Bradford Canal with that main waterway to a point near to the Buck Mill footbridge. The only buildings that are really near to the Dock Field works are the mills of Messrs. C. F. Taylor & Co. and a farmhouse or two. A large portion of the land taken is attached to Newmarket Farm. The estimate for the whole of the contracts came to something over 50,000*l.*, but it is pretty clear now that that sum will be exceeded considerably. An extra expenditure of nearly 5,000*l.* has been entailed by the demand of the Local Government Board for land filtration, in addition to the bacteriological treatment which has been decided upon by the District Council. The Ilkley and Otley branch of the Midland Railway passes across the land, and additional expense will be incurred in cutting through the railway embankment to carry two channels forward to the irrigation part of the works. The land set apart for that portion of the operations consists of nine acres, and occupies the end of the site nearest to Buck Mill. The intercepting sewers have both to be carried under the canal. They then communicate with a tank sewer of irregular formation, the average dimensions being 8 ft. 6 in. diameter. The tank sewer is 800 ft. long, and will accordingly hold a huge volume of sewage. The wall of this sewer adjoins the river, but the only overflow provided is a fixed one, in accordance with the regulations of the Rivers Board, necessitating that the tank sewer shall be full before it can possibly overflow. From the tank sewer the sewage will be pumped and forced to a height of about 45 ft. It will first enter the grit-tanks, of which there are three for alternate use. Here the gritty matter will be precipitated as the sewage flows towards the bacterial beds. Sludge-pits are provided for the reception of the matter precipitated in the grit-tanks. The sewage next passes to the bacterial beds, of which there are two series. Each series consists of four tanks, the coarse being each 100 ft. long by 66 ft. wide, and the fine the same length, but 72 ft. wide. These tanks are at the present time in the course of being filled with clinker, of which they hold a tremendous quantity. After this treatment the effluent will be carried, as already mentioned, to the land filtration works. At the suggestion of the Local Government Board, provision has also been made for the carrying of storm water in times of flood direct on to three acres of clinker ashes for filtration before being conveyed into the river. The chief erections in connexion with the works are an engine-house, 84 ft. by 33 ft. and about 30 ft. high; a boiler-house and destructor shed, 84 ft. by 62 ft., to contain four Lancashire boilers and a four-cell destructor of the latest design by Messrs. Meldrum & Co., Limited, of Manchester; a chimney, which has been christened the "Monarch," 60 yards high, 19 ft. square at the base, and with a flue of 7 ft. 4 in. diameter; stabling and workshops, and three cottages for workpeople. The engine-house has been made much larger than was originally proposed, in consequence of the intention to generate electricity not only for pumping purposes, but for street lighting and sale to some limited extent. Parliamentary powers have been secured for this purpose. The power for producing the electricity is intended to be obtained largely from the burning of refuse in the large destructor which is now in course of erection. Mr. Malcolm Paterson has acted as the Council's engineer in the carrying out of the whole of the works. The intercepting sewers were laid by Mr. William Foster, Bingley, and Messrs. Ross, Wilks, & Crabtree, Shipley. The drainage of the Windhill portion of the district was carried out by Messrs. Rhodes Bros., Shipley, under the direction of Messrs. W. B. Woodhead & Son, Bradford. The precipitation and other tanks have been constructed by Mr. Robert Wood, Bingley, and Mr. Thomas Smith, Bingley, has been entrusted with the preparation of the land for the irrigation process. The pumps, motors, and engines are being supplied by Messrs. Cole, Marchent, & Morley, Limited, of Bradford. The various contractors are as follow:—Mason's work, Messrs. H. Birkby & Sons, Wyke; plasterer's work, Messrs. Walker & Wilkinson, Shipley; plumber's work, Messrs. Wilks & Ross, and Mr. John Pitts, Shipley; joiner's work, Mr. William Atkins, Windhill; slater's work, Mr. Thomas Thornton, Shipley; iron work, Mr. J. B. Clabour, Guiseley. There have been two clerks of the works, Mr. J. E. Pickard and Mr. J. C. Coates, the latter being at present in charge.

BRIDGE ACROSS THE TAY AT PERTH. — The *Dundee Advertiser* gives some details of the bridge which is now in course of erection across the Tay at Perth. The work of the mason contractors (Messrs. Fraser & Morton, Perth) was commenced in May, 1898; but owing to the heavy flooding which took place during the succeeding winter, the operations were considerably delayed. There are six piers formed with steel caissons sunk into the bed of the river. Each cylinder is filled with cement concrete to the summer level of the river, and here the masonry of the piers commences. At the present time the piers are up to the finished level that take on the bed plates of the main girders. There will be two girders, 7 ft. high, 24 in. in breadth at the bottom and 18 in. at the top. The girder will be continuous until the centre of the bridge is reached, where there is to be a space for expansion. Altogether there will be four spans, 88 ft. long. There will be three cross girder bracings between the piers. On the top of the cross girders longitudinal piers parallel with the main girders will run from end to end, and will be jack-arched. On the top of the jack-arches the concrete is formed to take on the tar macadam, while the pavement of the bridge will be granolithic. There will be a gradual slope on the bridge, commencing from the building line in Tay-street, of 1 ft. in every 27 ft. The access from the Dundee-road is now finished, with the exception of the formation of the roadway. On each side is a

parapet wall, and at the back of the east abutment there is a flood arch 17 ft. wide. The following are the contractors:—Mason work, Messrs. Fraser & Morton, Perth; iron work, Arroll's Bridge and Roof Company. Mr. Frank Young (Messrs. Blyth & Wisliland) is the engineer, the clerk of works being Mr. Webster.

WATER SCHEME, EAST STIRLINGSHIRE.—At a meeting, on the 14th inst., of the Eastern District Committee of the Stirling County Council, a report by Messrs. Warren & Stewart, C.E., Glasgow, was read, giving details of a proposed scheme of water supply for the district from the Buckie Burn, on the Denny Hills. The estimated cost of the scheme is 50,700*l.*

SEWERAGE WORKS, BATLEY.—At the Town Hall, Batley, recently, Colonel W. Langton Coke, an inspector of the Local Government Board, held an inquiry concerning an application of the Corporation "for sanction to apply the sum of 1,848*l.*, being part of a loan raised with the sanction of the Local Government Board, in defraying the cost of works of sewerage and sewage disposal, which were not included in the estimate on which such loan was sanctioned." The town clerk stated that the corporation did not desire to ask the sanction of the Local Government Board to a loan for new works. During the progress of these works the corporation had made additions to what the Local Government Board originally sanctioned when first forwarding plans to that authority. The works consisted of two storage tanks, and the loan for such works was originally sanctioned in 1875. In 1877 the Local Government Board consented to a modification of the plan on which they originally sanctioned the loan, and the works were carried out. Afterwards the necessity for additions became apparent, and in 1896 the Corporation constructed these two large additional tanks at a cost of 1,143*l.* 4s. 2d. They were not in the original estimates, and the cost was charged to the loan account, and paid out of borrowed money raised under the sanction of the Local Government Board. There was a storage tank which had not been constructed, shown on the plan, which it was proposed to construct at a cost of 704*l.* 17s. 3d. The loan originally sanctioned was 32,160*l.*, plus 3,900*l.* for land, making a total of 36,060*l.* The idea of the new tank, which was to cost 704*l.*, was that the Corporation might have means of storing a limited quantity of sewerage in the event of any breakdown in their machinery.

WATER SUPPLY, WILLESBOROUGH, KENT.—A Local Government Board inquiry, conducted by Major-General H. D. Crozier, R.E., into the application of the East Ashford Rural District Council to borrow 11,000*l.* for the purpose of establishing a water supply for Willesborough, was held at the East Ashford Workhouse on the 13th inst. It is proposed to sink a well at Plumpton. The construction of a reservoir is also included in the scheme, for which Mr. Bayley-Denton is the engineer.

SEWERAGE WORKS, CHEAM.—Mr. E. A. Sandford Fawcett, Inspector to the Local Government Board, held an inquiry at the Parochial Rooms recently into the application of the Epsom Rural District Council for permission to borrow the sum of 4,700*l.* for the purpose of constructing sewers in Gander Green-lane and Belmont. It was pointed out that the sewers, when constructed, would obviate the necessity for further cesspools being made in the chalk, and that those now in existence would be done away with. Mr. H. D. Searles-Wood explained the details of the scheme.

STAINED GLASS AND DECORATION.

MEMORIAL WINDOW, PARISH CHURCH, GOODNESTON, NEAR DOVER.—A memorial window to the late Miss Emma Lawrence, of Goodneston, has been erected in the east end wall of the parish church. The window, which is of three lights, and represents St. Gregory attracted by the English boys sold as slaves in the Forum of Rome, was designed by Mr. Sebastian Evans, and executed by Mr. T. W. Camm, of Smethwick, near Birmingham.

REOPENING OF ST. ANDREW'S PRESBYTERIAN CHURCH, NOTTINGHAM.—St. Andrew's Presbyterian Church, Belgrave-square, Nottingham, was reopened on the 9th inst., after renovation. The walls have been repainted and the woodwork has been revarnished. A panelled screen has been fixed at each side of the organ and pulpit. The work has been carried out by Messrs. Marshall & Son and Messrs. J. H. Vickers, under the direction of Mr. J. Harris, architect, Nottingham.

MEMORIAL WINDOW, TRON CHURCH, EDINBURGH.—A memorial window has just been erected in this church. It was executed by Messrs. Ballantine & Gardiner, of Edinburgh.

MEMORIAL WINDOW, PARISH CHURCH, ANSFORD, SOMERSET.—A stained glass window, to the memory of the late Mrs. McKerrow, has just been erected in the south aisle of Ansford parish church. The window is of two lights, and was executed by Messrs. Frederick Drake & Sons, of Exeter.

WINDOWS, SUNBURY CHURCH.—Two new stained glass windows, of two lights each, have recently been placed in the Parish Church, Sunbury-on-Thames. The subjects are:—In the south window, St. James and St. John; in the north window, St. Philip and St. Bartholomew. The work is similar in style to the window (St. Peter and St. Andrew) fixed in December last, and the whole series have been carried out by Messrs. Joseph Chater & Sons, of London, from the designs of Mr. G. Ostrehan.

ELECTRIC LIGHTING NEWS.

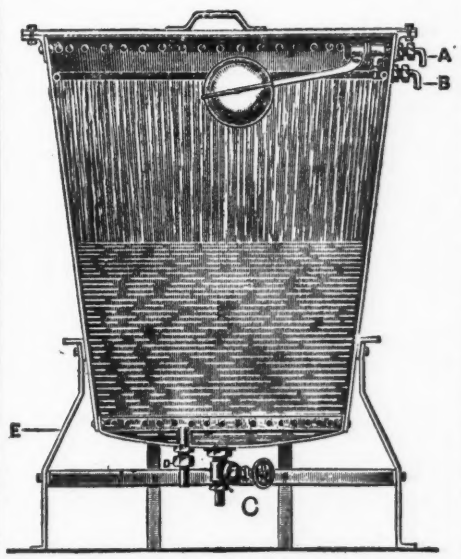
ELECTRIC LIGHTING, LERWICK.—At the meeting of the Lerwick Burgh Commissioners on the 5th inst. a report by Mr. R. Frederick Yorke, electrical engineer, Glasgow, was submitted as to the proposed introduction of the electric light into Lerwick. He finds that the Sandy Loch, from which the water supply of the town is at present drawn, contains sufficient surplus water for power purposes to give 80 horse-power for six hours per day, the gross fall being 220 ft. He recommends that a turbine-house should be built at Loch Clickimin, which would involve the laying of a 16-in. pipe from the Sandy Loch to that point, a distance of about 2,000 yards. In order to avoid drawing too largely on the Sandy Loch during the summer time, the engineer proposes to utilise a smaller loch near to it, by which means an additional storage would be obtained of 6 ft. over the whole area, and which he estimated would be capable of giving sufficient water for dealing with the summer supply—say, a period of three months. The electric current would be conveyed from the turbines to the accumulator-house. The total cost of the undertaking is estimated at 9,260*l.*, and the working expenses, including interest and sinking fund, at 968*l.* It was decided to circulate the report among the Commissioners prior to the next monthly meeting.

MISCELLANEOUS.

PROFESSIONAL AND BUSINESS ANNOUNCEMENTS.—Mr. John W. Simpson, architect, has removed his offices from 10, New Inn, Strand, to 3, Verulam Buildings, Gray's Inn.——Mr. Ernest Farrar, contractor for architectural ironwork, &c., and London representative for Messrs. Brookes & Co., of Manchester, has removed his offices from Berners-street to 27, Old Queen-street, Westminster.

REREDOS, ST. MARGARET'S CHURCH, LYNN.—A reredos is being erected in this church from the designs of Mr. G. F. Bodley.

DURRANS' SELF-CLEANSING CISTERN.—The cistern illustrated here is patented by the Durrans' Patents Syndicate for the storage of pure and clean drinking-water. The tank is circular in shape, with conoid sides and bottom, and mounted on an iron-framed stand (E) for easy access to a clear-way emptying valve (C). The ball valve (A) has a circular flushing-pipe, so that when the valve (C) is opened all collection of dirt, sand, and sediment is completely washed away from inside the cistern in three minutes. For convenience, where cisterns are fixed inside roofs and other inaccessible places, the valve (C) can be fixed anywhere with a length of



Durrans' Self-Cleansing Cistern.

pipe to discharge over a sink or gully below, or in the bath-room; by this arrangement the valve (C) can be turned on and off at will without the slightest trouble. D is the union, with connecting piece standing up 3 in. from the bottom of the cistern, for the supply of pure drinking-water, B the union for overflow. The cistern is fitted with a galvanised iron cover, bolted down with nuts and screws to prevent any foul matter contaminating the water, or cats, birds, beetles, and mice entering therein, frequently found in old-style cisterns. The water enters at the bottom, avoiding the noise and stirring up of sediment produced by a cataract from an entry at the top.

NEW BOOKS.—Amongst the books announced for publication this autumn are:—"The Evolution of Household Implements," by Mr. Henry Balfour; "History of the Fine Arts," by Professor G. Baldwin Brown; "How to Make and How to Mend," by an Amateur Mechanic; "The Art of Botticelli," by Mr. Herbert Horne (a limited edition); "Dante Gabriel Rossetti, an Illustrated Memorial of his Art and Life," by Mr. H. C. Marillier; "Rembrandt van Rijn and his Work," by Mr. Malcolm Bell; "The Pre-Raphaelite Painters, their Associates and their Successors," by Mr. Percy H. Bate; "Sir J. E. Millais, his Art and Influence," by Mr. A. Lys Baldry; "A History of Gothic Art in England," by Mr. E. S. Prior, illustrated by Mr. G. C. Horsley; "A Treatise on Stair-building and Hand-railing," by Messrs. W. and A. Mowat; "Luton Church, Historical and Descriptive," by the Rev. Henry Cobbe; "Tewkesbury Abbey," by Mr. H. J. L. J. Massé; "Wimborne Minster, and Christchurch Priory," by the Rev. T. Perkins; "Westminster Abbey," by Mr. Charles Hiatt—uniformly with Bell's "Cathedral Series," which will comprise "Carlisle," by Mr. C. King Eley; "Worcester," by Mr. E. F. Strange; "Chichester," by Mr. H. C. Corlette; "Ely," by the Rev. W. D. Sweeting; "Ripon," by Mr. C. Hallett; "St. Asaph" and "Bangor," by Mr. P. B. I. Bax; "Bristol," by Mr. Massé; "St. David," by Mr. Philip Robson; "St. Paul," by the Rev. A. Dimock; "St. Albans," by the Rev. W. D. Sweeting; and "Glasgow," by Mr. P. M. Chalmers; "Greek Terra-cotta Statuettes," and "Greek Terra-cottas," by Mr. C. A. Hutton; "Greek Bronzes," by Dr. A. S. Murray; "Reliques of Old London" (the Thames and Southern Suburbs), by Mr. T. R. Way; "French Painters of the Eighteenth Century," by Lady Dilke; and the opening volumes of a new series entitled "The Great Masters in Painting and Sculpture," edited by Dr. G. C. Williamson; "Bernardino Luini," by the editor of the series; "Velasquez," by Mr. R. A. M. Stevenson; "Andrea del Sarto," by Miss H. Guiness; "Luca Signorelli," by Miss Cruttwell; "Raphael," by Mr. H. Strachey; and "Correggio," by Mr. Selwyn Brinton; and "The London Government Act, 1889," with notes, introduction, and index, by Mr. G. P. Warner Terry and Mr. P. Bartlett Morle.

ELECTRIC LIGHTING, CHELTENHAM. — An inquiry was held on the 12th inst. by Colonel Hepper, R.E., Inspector to the Local Government Board, into an application made by the Corporation for sanction to borrow 16,600*l.* for extension of works, plant, mains, &c., in connexion with the electric light undertaking. The Borough Surveyor (Mr. Hall) gave evidence as to the building extensions which had become necessary, and Mr. Kilgour (Borough Electrical Engineer) gave details of the new plant, &c., required.

NATIONAL REGISTRATION OF PLUMBERS.—The ninth annual public meeting of Registered Plumbers in the counties of Aberdeen, Kincardine, and Banff, was held in the Robert Gordon's College, Aberdeen, on Tuesday evening, Professor Matthew Hay presiding. The report of the Council for the year was submitted and adopted, and the following resolution was carried unanimously:—"That this meeting renews its expression of warm approval of the Plumbers' Registration Bill, being of opinion that the passing of the Bill is essential to the continuance of the registration movement—a movement which, it is generally admitted, is rendering important services to the public health." The annual public meeting of the Perth branch of the National Registration of Plumbers was held at Perth on Saturday, the chair being taken by ex-Bailie M'Leish. The report of the branch was read and adopted. The subject of admission to the plumbers' classes was discussed, and a deputation from the District Council for the counties of Forfar, Perth, and Fife was present and reported to the meeting that the Council had before them a scheme under which apprentices coming forward to the classes, if not quite educationally fit to enter them, were taken in hand and given some preliminary teaching.

NEW ELECTRIC LIGHT FITTING. — The "Monarch" adjustable ball fitting, made by the Edison and Swan United Electric Light Company, is worthy of special notice, as it affords an excellent solution of the problem of setting up an electric lamp so that it can be at once placed at any height and in any position in a room. The drawback to using many of the present fittings for this purpose, especially those which are arranged with a movable arm projecting from another arm fixed in the ceiling, is that the enormous leverage is bound sooner or later to loosen the junction to the ceiling. The "Monarch" fitting consists roughly of two balls, one below the other, the flexible cord going through them, and the part of it between the upper ball and the ceiling rose acts as a swivel, thus allowing one to walk round the room with the light. The construction is very simple, there being no springs or other mechanism likely to get out of order. This fitting is suitable when a movable light is required, and, as compared with similar fittings for this purpose, it is very cheap.

FOUNDATION-STONE OF OLD VAUXHALL BRIDGE.—No record appears to exist of any ceremony connected with the foundation-stone of the bridge now in course of demolition. Careful observation has, however, been made of all material removed, in the hope that the stone itself might be discovered. This precaution, it is gratifying to notice, has been rewarded by success. Deeply buried amongst the

lower courses of masonry, and below water level' the foundation-stone was ultimately found above the pile-supported platform of the Westminster abutment. On removing a second stone attached as a sort of cover, a glass case was disclosed, containing a slab of silver 8 in. in length by 5¼ in. wide, and on this is inscribed a legend to the effect that on May 9, 1811, the first stone of the bridge was laid by H.R.H. George, Prince of Wales, Regent of the United Kingdom of Great Britain and Ireland, represented by the Right Honourable Thomas Lord Dunbar. The names of the chairman and members of the Committee of Proprietors of Vauxhall Bridge Company, and of John Rennie, civil engineer, F.R.S., are also appended. The block enclosing this interesting tablet was so literally a foundation-stone that its discovery was only effected as the result of a most painstaking search, for which every credit is due to the contractors. Rennie's bridge was the first iron structure of the kind across the Thames, and the auxiliary masonry is shown by recent operations to have been of admirable quality, both as to material and workmanship. The present contracts include the demolition of old works and reconstruction up to the impost course. Afterwards will come once more the vexed question of superstructure, with regard to which our views are well known. For the moment we need only express the sincere hope that the London County Council, whilst accepting the guidance of their engineer in matters on which he is specially qualified to judge, will also be guided by experts similarly competent to advise upon artistic design and details.

EMPLOYMENT IN THE BUILDING TRADES DURING AUGUST.—According to the *Labour Gazette* employment in the building trades in August remained good. The percentage of unemployed union members among carpenters and plumbers at the end of the month was 1·2, compared with 1·1 in July, and 0·9 per cent. in August of last year. Five disputes began in August, affecting 354 workpeople. Two of these, which were in regard to wages, have been settled, the advance demanded having been conceded. Of the five disputes, one was in England, three in Scotland, and one in Ireland.

THE SITE FOR THE NEW MUNICIPAL OFFICES, CHELTENHAM.—In response to offers invited by the Cheltenham Corporation, nine sites have been placed at their disposal for the proposed new municipal offices for the borough. These, it is expected, will come before the Town Council for consideration at the monthly meeting in October next, and the final decision will probably then be adjourned till after the November elections. The prices asked for the different sites vary considerably. Thus, the Assembly Rooms are available at the cost of 13,500*l.* These rooms are situated in a central position in the High-street, and contain a frontage of 112 ft. and a depth of 141 ft., the buildings standing on exactly half an acre of ground. There is no doubt as to the suitability of the position, but possibly the price will be considered prohibitive. Still, the rooms offer advantages which cannot be claimed for any of the other sites. They contain the finest ball-room in the county, and the destruction of this need not be involved in the adaptation of the premises for the purposes of municipal offices. There are two other sites offered in High-street. One of these is that of the premises which now do duty as municipal offices, together with the offices of the firm of Messrs. Brydges, Mellersh, & Brydges, and Nos. 2 and 3, Church-street, the price for which would be 8,250*l.* This site contains more than the area advertised for (500 square yards), and has the advantage of being as central as the Assembly Rooms. The other High-street site is Nos. 147, 148, and 148A, with Nos. 1, 2, and 3, Bennington-street. The price for this is 7,750*l.*, and it is nearly opposite the present municipal offices. The cheapest site is one close to the Public Library—viz., Chester Lodge and Nos. 9, 10, and 11, St. George's-place, which could be obtained at 1,800*l.* The Imperial Rooms, with No. 35, Promenade, are offered at 5,000*l.*; Livorno Lodge, North-place, at 3,500*l.*; Beech House, St. George's-place, with cottages adjoining, at 6,000*l.*; Nos. 26 and 27, Clarence-street, at a similar price; and Nos. 7 and 8, North-street, at 4,500*l.*—*Birmingham Post.*

ELECTRIC LIGHTING, NEWCASTLE.—On the 14th inst. the New Tramways Committee and the Watch Committee held a joint meeting to consider the report of Mr. Hopkinson as to lighting the streets of Newcastle with the electric current and from the poles used for the new tram service. It is proposed to light the main thoroughfares with 10-ampere arc lamps, to be placed 40 yards apart, the current to be so arranged that alternate lamps may be extinguished at midnight. The system proposed provides that a breakage in the trolley wires will not interfere with the lighting of the streets. Mr. Hopkinson's estimates show that the cost to the Corporation of lighting each of the lamps would be about 12*l.* per annum.

PHOTOGRAPHS OF WESTMINSTER ABBEY.—Messrs. S. B. Bolas & Co. are issuing a series of photographs of Westminster Abbey, 8 in. by 6 in., in neat cases, eight in each case. Two of the sets are before us. The photographs are very good; clear but not hard, and the size is a convenient one for keeping.

TECHNICAL INSTITUTES.—We have received the prospectus for 1899-1900 of the "Northampton Institute," which forms a branch of the City Polytechnic, and specially aims at providing classes in Technological and Trade subjects, specially arranged for the benefit of artisans and apprentices. The classes embrace almost every subject in connexion with practical workmanship; also classes in architectural drawing and in various artistic handicrafts—decorative metal-work, woodcarving, silversmith's work, &c., and among others "architectural ornament for builders," the subjects included under this heading forming the advanced courses for building trade students. A course of study which may at all events enable them to understand better the carrying out of architectural decoration and assist the architect in his aims.——The scheme of the Borough Polytechnic Institute includes trades, science teaching, and art classes, the latter under the direction of Mr. G. Woollescroft Rhead.

THREATENED STRIKE AT CHICAGO.—According to the *American Architect and Building News* of September 9, Chicago has been, or is, threatened with a building strike on a large scale and on a most trivial occasion. The contractors for the new Post Office building have dared to have the corner-stone of that edifice not only dressed out of the State but even by non-union men. "Seemingly," says our contemporary, "nothing but a big strike, which shall throw out of work thousands of workmen and do a business injury to hundreds of other builders who are in no way responsible for this heinous act, could atone for so gross a wrong to labour."

LEGAL.

ALLEGED INJURY TO BUILDINGS THROUGH VIBRATION.

THE case of Herrick and Taylor *v.* Turpin & Son came before Mr. Justice Darling, sitting as Vacation Judge, on the 20th inst., on a motion by the plaintiff for an interim injunction to restrain the defendants until the trial from using an engine so as to cause nuisance or injury to the plaintiffs' building and premises, situated at 17, Castle-gate, Nottingham, by vibration.

Mr. Everett, Q.C., in support of the motion, said the matter was a rather heavy one. The first plaintiff, Mr. Herrick, was a medical man, and, owing to the nuisance complained of, he was unable to carry on his practice, and he proposed to ask the Court for a provisional order giving the plaintiff some relief.

Mr. Alexander, Q.C., for the defendants (interposing), complained that this was not vacation business. There were some forty affidavits on one side and the other, and he thought that the case ought to be tried at the Nottingham Assizes, where he believed it could be heard and disposed of in February next. Mr. Justice Cozens-Hardy had expressed an opinion that this was not a case which could be conveniently dealt with on motion.

Mr. Everett submitted that if this offer was accepted the defendants should be put on terms. The nuisance to Mr. Herrick was most intolerable. What had happened was this. The defendants, who were grocers and provision merchants, had erected very large engines for manufacturing all kinds of things, and they used a great deal of machinery, including a dough-kneading machine; and one of the plaintiff's grievances which appeared to be most immediately pressing pending the trial of the action was the use of an apparatus for keeping meat cool in a refrigerator worked by machinery.

In the result his lordship ordered that the motion should stand till the trial, the costs of the motion to be costs in the action. His Lordship expressed an opinion that the case ought to be tried by a Judge at Nottingham.

ACTION OF THE POSTMASTER-GENERAL TO RESTRAIN THE INFRINGEMENT OF ANCIENT LIGHTS.

THE case of Her Majesty's Postmaster-General *v.* John Howell & Co., Ltd., came before Mr. Justice Darling, sitting as Vacation Judge, on the 20th inst., on a motion by the plaintiff to restrain the erection of a building which it was alleged interfered with the access of light to a savings bank in the City.

Upon the case being called on, Mr. Boone, for the defendants, asked for an adjournment in order to answer affidavits, and after some discussion it was arranged that the case should stand over for a fortnight, the defendants agreeing not to build higher or beyond the height of their old building as shown on the plan meanwhile.

His Lordship refused to make an order that the Postmaster-General should give the defendants an undertaking in damages on the ground that there was no precedent for such a course.

INJUNCTION AGAINST A BUILDER FOR BUILDING IN CONTRAVENTION OF COVENANTS.

THE case of Cartright *v.* Schofield and Others came before Mr. Justice Darling, sitting as Vacation Judge, on the 20th inst., on a motion by the plaintiffs to restrain the defendants, Messrs. Schofield, Burridge, and Daniels, from building on certain plots of land, part of a building estate, in alleged contravention of the covenants contained in a trust deed of a land society.

Counsel in support of the application said that the plaintiffs were the holders in fee of certain plots of building land, part of their estate being subject to building restrictions. Messrs. Schofield & Burridge, the first two defendants, were the owners in fee of certain other plots of the same estate, subject to the same restrictions. These two gentlemen were originally the only defendants to the action, Mr. Daniels being joined as a defendant quite recently. This gentleman, who held his land under a lease from Schofield & Burridge for a term of 800 years, was building on his land in contravention of the building restrictions.

Counsel for Mr. Daniels stated that he was not in a position to resist the motion. His client was prepared to submit to a perpetual injunction, and to treat the motion as the trial of the action, and to pay any reasonable sum for costs; but he would, of course, object to pay any costs occasioned by the plaintiffs improperly joining Messrs. Schofield & Burridge as defendants.

Counsel representing Messrs. Schofield & Burridge said there was no occasion for the plaintiffs to join these gentlemen as defendants at all. The plaintiffs knew on August 11 last that the person who committed a breach of the building restrictions was Daniels. Messrs. Schofield & Burridge, before granting Daniels his lease, gave him the most full notice of the restrictions in the trust deed. They were, therefore, not to blame for what Daniels had done, and were, he submitted, improperly made defendants in the suit.

In the result his Lordship ordered the defendant Daniels to submit to a perpetual injunction in the terms of his offer and to pay the costs, except so far as they had been increased by the joinder of the other defendants. Although he should give no costs against Messrs. Schofield & Burridge, he should make an order that they should pay their own costs, because when they were written to by the plaintiffs' solicitors, they did not explain that they had no interest in the matter, but said that they had instructed their solicitors to defend any proceedings.

Order accordingly.

"RUSHING UP" A BUILDING.

CASE IN THE VACATION COURT.

THE case of Ward, Lock, & Co., Limited, *v.* the Gas Light and Coke Company came before Mr. Justice Darling, sitting as Vacation Judge, on the 20th inst., on a motion by the plaintiffs to restrain the defendants until the trial from raising or heightening a building so as to interfere with the plaintiffs' ancient lights.

Upon the case being called on, Mr. Everett, Q.C., for the defendants, asked that it might be ordered to stand over till next week in order to answer affidavits filed by the plaintiffs.

Mr. Alexander, Q.C., for the plaintiffs, said that if that application were granted, he should ask that the defendants should be ordered to suspend their building operations meanwhile. The evidence proved that the defendants had been "rushing up" their building in the hopes that the Court would not order them to pull it down. Notwithstanding the merits of the case, the Court had in the case of Daniels *v.* Fergusson ordered a building to be pulled down, the building having been "rushed up" in circumstances such as in the present case.

In the result, the application for an adjournment was granted, the defendants being ordered to suspend their building operations to the roof and top floor meanwhile.

HOUSES ON DAMP SOIL.

THE York magistrates, on the 18th inst., heard a case in which Mr. Cyrus Birkill, builder, Avenue-terrace, Clifton, York, was summoned at the instance of the City Engineer (Mr. A. Creer), for an offence against the building by-laws. There were ten separate informations in respect of ten new houses in Kensington-street, Bishopthorpe-road, but the offence charged in each was the same, namely, that the defendant had not caused the whole of the ground surface or site to be properly asphalted or covered with good cement concrete, which was required by the dampness thereof. The Town Clerk appeared to prosecute, and Mr. Dashwood Carter defended.—The City Engineer stated that the plans of the houses were passed with the condition attached that the site should be covered with six inches of good concrete. The concrete, which had been put down was of an inferior quality of cement, and the material was unclean. He produced a sample taken from one of the houses, which was black, and was easily broken by the Chairman of the Bench with his fingers. Mr. John Oglesby, building inspector, also gave evidence. Mr. Carter, for the defence, said he should call expert evidence to show that the concrete was good, and sufficient for a damp site. Mr. Chapman de Burgh, for whom the defendant built the houses, had expressed himself satisfied with the defendant's work; the architect whom Mr. Chapman de Burgh

had employed would tell them he was prepared to pass it, and there had been no complaints from the tenants. After several witnesses had been called, Mr. D. S. Mackay (chairman of the Bench) said the opinion of the magistrates was that the sample was not concrete at all. The defendant would be fined £1 and costs for each of the ten houses. The defendant was allowed a month in which to put in proper concrete.—*Leeds Mercury.*

MEETINGS.

FRIDAY, SEPTEMBER 22.

Sanitary Institute (Lectures for Sanitary Officers).—Mr. John Castell-Evans on "Air and Ventilation." 8 p.m.

SATURDAY, SEPTEMBER 23.

Association of Municipal and County Engineers.—Meeting at Merthyr Tydfil. 10.45 a.m.

MONDAY, SEPTEMBER 25.

Sanitary Institute (Lectures for Sanitary Officers).—Mr. John Castell-Evans on "Water." 8 p.m.

WEDNESDAY, SEPTEMBER 27.

Sanitary Institute (Lectures for Sanitary Officers).—Mr. John Castell-Evans on "Soil and Local Physical Conditions." 8 p.m.

Builders' Foremen and Clerks of Works' Institution.—Quarterly meeting of the directors. 8 p.m.

FRIDAY, SEPTEMBER 29.

Sanitary Institute (Lectures for Sanitary Officers).—Mr. John Castell-Evans on "Meteorology." 8 p.m.

PRICES CURRENT OF MATERIALS:

WOOD.*

Per Petersburg standard hundred.

	£	s.	d.	£	s.	d.
White Sea: first yellow deals	17	5	0	18	5	0
Second do.	13	10	0	15	0	0
Third do.	11	15	0	13	0	0
Battens, 40s., 30s., and 15s. less respectively.						
Petersburg: first yellow deals	14	0	0	16	10	0
Second do.	11	0	0	12	10	0
Battens, 30s. and 20s. less respectively.						
Petersburg, white deals	10	0	0	12	0	0
Do. white battens	8	15	0	10	5	0
Riga, white deals	8	10	0	9	10	0
Swedish mixed yellow deals	13	10	0	17	0	0
Third do.	12	10	0	15	0	0
Fourth do.	11	0	0	12	0	0
Fifth do.	10	0	0	11	0	0
Battens, 30s., and 10s. less respectively.						
Whitewood, 10 to 20 per cent. less.						
Finnish unsorted yellow deals	10	0	0	10	10	0
Battens, 10s. and 5s. less respectively.						
Whitewood, 5 to 10 per cent. less.						
Norwegian second yellow battens	7	10	0	8	0	0
Third do.	7	0	0	7	10	0
Fourth do.	6	10	0	7	0	0
Whitewood, 10s. less.						
Danzig, Crown Deck deals, per 40 ft. 3 in.	0	15	0	1	5	0
Brack	0	12	0	1	0	0
St. Lawrence Pine deals, &c., per P.S.H.:—						
1st, Bright and Dry, regular sizes	20	15	0	27	5	0
" " oddments	13	15	0	20	10	0
2nd " regular sizes	15	15	0	19	0	0
" " oddments	11	5	0	14	15	0
3rd " regular sizes	9	15	0	11	5	0
" " oddments	8	5	0	9	5	0
4th " regular sizes	8	0	0	8	15	0
" " oddments	7	5	0	8	0	0
St. Lawrence Spruce deals, &c.						
First, regular sizes	9	0	0	11	0	0
Second "	7	15	0	8	15	0
Third "	7	10	0	8	5	0
Fourth "	6	10	0	7	5	0
Oddments and battens at 20s., 10s., 7s. 6d., and 5s. less respectively.						
New Brunswick Spruce deals, &c.	7	10	0	8	5	0
Oddments, battens, and fourths	6	15	0	7	15	0
United States pitch pine planks and boards	8	15	0	12	5	0
Prepared Boards, per square						
1½ by 6½ and 7 in. 1st yellow		11	0		15	6
" " 2nd "		7	0		11	3
1 by 6½ and 7 in. 1st "		10	3		11	9
" " " white		8	0		10	3
" " 2nd yellow		8	0		10	3
" " " white		6	3		8	0
⅞ by 6½ & 7 in. 1st & 2nd yellow		7	9		8	9
" " " white		7	0		8	3
¾ by 6½ and 7 in. 1st yellow and white (grooved, tongued, and beaded)		7	9		8	6
¾ by 6½ and 7 in. 2nd yellow and white (ditto)		7	3		8	0
⅝ by 6½ and 7 in. 1st yellow and white (ditto)		5	9		6	9
⅝ by 6½ and 7 in. 2nd yellow and white (ditto)		4	9		5	9
Narrower widths at 10 per cent. less. 3rd quality at 15 per cent. less than 2nd.						
Danzig and Memel Fir Timber— per load						
Best middling	3	0	0	3	5	0
Good middling and Second	2	10	0	3	0	0

* The prices named are for the wood as imported and landed in the docks. Ten per cent., approximately, should be added in order to arrive at the current trade prices

PRICES CURRENT—*continued.*

	£	s.	d.	£	s.	d.
Common middling	2	5	0	2	10	0
Undersized	2	5	0	2	15	0
Swedish and Norwegian Balks	2	5	0	2	10	0
Baltic Oak Timber—						
Danzig and Stettin—Large	3	0	0	3	10	0
Small	1	15	0	2	0	0
Quebec Timber per load						
Yellow Pine	5	0	0	6	15	0
Oak	4	2	6	6	0	0
Elm	4	12	6	5	5	0
Ash	3	15	0	4	15	0
Birch	2	12	6	4	10	0
New Brunswick, &c., Birch	1	10	0	2	2	6
American Pitch Pine Timber	3	7	6	3	17	6
Wainscot, per log, 18 cubic ft.—						
Crown (Eng. & Dutch) } nominal	3	17	6	5	10	0
Brack }	3	2	6	4	2	6
Lathwood, per cubic fathom—						
Petersburg	4	0	0	6	10	0
Riga and Danzig	4	10	0	5	10	0
Norway Poles, per ft. run	0	0	1	0	0	1½
Oak Staves, per mille full size pipe						
Memel, Crown	210	0	0	220	0	0
Brack	180	0	0	190	0	0
Danzig	165	0	0	175	0	0
Bosnia, single Barrel (nominal)	98	0	0	30	0	0
United States, Pipe	35	0	0	42	10	0
Hogshead, extra heavy and double extra	27	10	0	32	10	0
Indian Teake per load	11	10	0	16	10	0
British Guiana Greenheart	0	0	0	8	0	0
Mahogany, per foot superficial—						
Honduras, cargo average	0	0	4½	0	0	6
Nicaragua, do.	0	0	4½	0	0	5½
Tabasco, do.	0	0	4	0	0	6½
Mexican, do.	0	0	3½	0	0	4
Panama, do.	0	0	3	0	0	4
African, do.	0	0	3½	0	0	5
Cuba, do.	0	0	5½	0	0	7½
St. Domingo, do.	0	0	5	0	0	7
Do. Curls (good to prime)	0	0	9	0	1	3
Walnut, American (logs)	0	2	3	0	4	6
Do. do. (planks and boards)	0	2	0	0	7	6
Italian, per foot superficial	0	0	3	0	0	7½
Black Sea, per ton	6	0	0	12	0	0
Satin Walnut (logs) per foot cube	0	1	0	0	1	3
" (planks and boards)	0	2	0	0	2	9
Sequoia (Californian redwood), per foot cube	0	1	9	0	2	0
Whitewood, American (logs)	0	1	3	0	1	6
" " (planks and boards)	0	1	6	0	2	9
Quartered oak " " "	0	2	3	0	4	0
Kauri pine (logs)	0	1	9	0	2	0
" " (planks)	0	2	3	0	2	9
Jarrah (planks)	0	2	3	0	2	6
Lancewood spars each, fresh and large	0	5	0	0	8	0
Lancewood spars, ordinary to fair	0	4	0	0	5	0
Degame spars	0	8	0	0	10	6

METALS.

	£	s.	d.	£	s.	d.
IRON—Pig, in Scotland ton	3	9	9½	0	0	0
Bar, Welsh, in London	6	0	0	6	5	0
Do. do. at works in Wales	5	15	0	5	17	6
Do. Staffordshire, in London	6	5	0	7	10	0
COPPER—British cake and ingot	80	5	0	80	15	0
Best selected	81	5	0	82	0	0
Sheets, strong	86	0	0	88	0	0
Chili bars	76	8	9	0	0	0
YELLOW METAL lb.		6¾d.			7¼d.	
LEAD—Pig						
Spanish ton	15	10	0	0	0	0
English Com. Brands	15	15	0	0	0	0
Sheet, English, 6 lbs. per sq. ft. and upwards	16	15	0	0	0	0
Pipe	17	5	0	0	0	0
ZINC—English sheet ton	27	0	0	0	0	0
Vieille Montagne	28	0	0	0	0	0
Spelter	22	0	0	22	10	0
TIN—Straits	145	15	0	0	0	0
Australian	146	0	0	146	10	0
English Ingots	149	0	0	150	0	0
Banca	0	0	0	0	0	0
Billiton	0	0	0	0	0	0

OILS.

	£	s.	d.	£	s.	d.
Linseed ton	22	0	0	0	0	0
Cocoanut, Cochin	29	5	0	0	0	0
Do. Ceylon	25	15	0	0	0	0
Palm, Lagos	24	0	0	0	0	0
Rapeseed, English, pale	24	15	0	0	0	0
Do. Brown	23	5	0	0	0	0
Cottonseed ref.	17	15	0	18	15	0
Oleine	17	5	0	19	0	0
Lubricating U.S.	0	5	9	0	7	9
Do. Black	0	5	0	0	6	0
TAR—Stockholm barrel	1	6	6	0	0	0
Archangel	1	0	0	0	0	0
Turpentine	36	10	0	0	0	0

RECENT PATENTS:

ACCEPTED SPECIFICATIONS.

Open to Opposition until November 13.

[1898] 16,697, Rossborough & Pile, Preparing Clay that Contains Large Quantities of Stones, for the Manufacture of Bricks, Tiles, &c. 19,030, Ruble, Pumps for all Uses. 19,326, Zimmermann, Antiseptics and Deodorisers. 19,479, Lange, Self-closing Valves or Cocks. 19,585, White, Gulley-trap. 19,674, Robinson; 23,230, Gilmer; and [1899] 14,499, Söderberg, Generation of Acetylene Gas. 19,828, Pomeroy, Electrical Arc Lamps. 20,012, Burton, Adjustable Wrenches. 20,101, Youlten, Weather Checks for Doors and Casements. 20,491, McGill, Window Sashes Opening Inwards. 21,134, Appleton, Cramps. 21,342, Lynde, Rising, Lowering, Locking, and Unlocking Mechanism. 22,700, Edmunds, Tubes or Conduits, more Especially Intended for Containing Electrical Cables or Conductors. 22,882, Gasse, Artificial Stone, Marble, &c. 23,334, Peloux, Electricity Meters for Continuous and Alternating Currents. 23,346, Bond, Preparing Calcium Carbide for Use in Making Acetylene. 23,401, Ball, Coupling-link for Chains, Warps, Ropes, &c. 23,510, Spencer, Insulators for Incandescent Electrical Lamps. 23,609, Theed, Gas Irons. 23,814, Martin, Window Sashes. 23,833, Evans & Hopwood, Hydraulic Rams. 24,965, Hanchett & Sage, Electrical Resistance Measuring Instrument. 25,316, Lacolle, Smoke-consuming Stove. [1899] 3,213, Grandage, Production of Ornamental Effects upon Textile Fabrics. 9,228 and 9,230, Batcheller, Pneumatical Dispatch Systems. 10,510, Barr, Alarms Operated by Smoke or Non-combustion Supporting Gases. 11,070, Gould, Lead Battery-plates. 13,260, Dunbar, Fire Apparatus for Heating Rooms. 13,340, Fales, Device for Consuming Smoke in Furnaces. 13,613, Archer, Automatical Gas-lighters. 14,298, Tietjen, Window-cleaning Appliance. 14,950, Clayton, Apparatus for Fumigating and Extinguishing Fires in Closed Compartments. 15,078, Ehrenbacher, Incombustible Lamp-wicks. 15,344, Steward, Gas Burners Especially Adapted for Acetylene Gas. 15,348, Peck, Clutches. 15,558, Becker, Roofing Tiles. 15,848, Petermann, Auxiliary Cheeks and Jaws for Vices. 15,992, Steinforth, Locks for Safes, &c. 16,000 Robinson, Chucks or Holders for Rotary Cutters. 16,005 Swan, Incandescent Electrical Lamps. 16,009, Collins & Collins, Machine Tools for Moulding Stone. 16,090 Leaver, Doors, Shutters, &c. 16,165, Mayer, Process o Ornamenting Metal Articles, and Metal Articles so Ornamented

ABSTRACTS OF PATENTED INVENTIONS.

11,222-5.—GAS COOKING STOVES AND THEIR PARTS: *H. A. Price & H. C. Turner.*—The inventors' improvements comprise (11,222) the protection of the burners and of enamelled plates by means of covering plates fastened beneath flanges on the stove's sides; (11,223) a perforated crown-plate through which pass the hot air and fumes from the oven, and which, together with the hot-plate, is flanged, the engagement of the flanges forming an air-tight joint, so that the gases pass by the regulating damper and round the sides to a flue at the hot-plate's opposite end; (11,224) the casting of the burner with arms to rest upon brackets and locking it in place by a bar that passes through recesses on a lug and in brackets cast upon the frame-plate's outer side, so that the burner can be readily removed; and (11,225) making the hot-plates easily removable by means of side-flanges in which they slide.

11,233.—SELF-CLEANING SCREEN, OR SIEVE: *A. Adams.*—The end-plates of the frame are fitted with hitch-pins and wrest-pins respectively, between which are tightly stretched pianoforte steel wires laid across the bridges; the wires are protected from injury, and the frame is stiffened, with crossbars on its underside.

11,268.—PILES FOR SEA AND RETAINING WALLS: *W. Fitzner & P. Janke.*—The tubular steel piles have pointed or wedge-shaped ends, their sides are grooved in order to receive the rounded sides of the adjacent piles, and they may be made of tubes, circular or elliptical, in cross-section; the ground is bored and the piles are rammed in and filled with cement.

11,320.—IGNITION OF GAS: *A. für F. von Broncewaaren & Zinkguss, v. J. C. Spinn & Sohn & S. J. von Romocki.*—When the plug of the gas-cock is turned, electrical contact is made and broken between a sliding pin mounted on an insulated support and a piece attached to the plug, and the contact completes the circuit of an electrical sparking or incandescent gas-ignition apparatus within a casing around the tube.

11,325.—APPLIANCES FOR STOVES: *B. Stocks.*—Under this invention, the coal-saving contrivance is also adapted for use as a rack or shelf for plates, dishes, flat-irons, &c., a rib has lugs which engage the range's top bar, and hanging arms braced together at the bottom; in one arm is a slot and in the other a recess for the ends of the grate, and lugs upon the two arms retain the grate in its place, when it serves as a coal-saver. The grate, when freed from the lugs and turned down horizontally, serves as a shelf or rack, and when it is in that position, the bar which braces together the hanging arms already mentioned is engaged by stops.

11,347.—COUNTING APPARATUS FOR CRANES: *M. L. A. Bohic.*—As the load is lifted it pulls down a draw-rod, swings two levers towards one another against the pressure of two springs, and, by means of a link, throws an arm over the hook's mouth. When the levers swing together a rigid latch and a spring latch engage, and two other levers throw up a rod which marks the register. The contrivance provides for the non-removal of the load until the latches are separated by means of a key.

11,357.—COLLECTION OF RAIN-WATER: *W. O. Baumgartner.*—Rain-water passes from the roof down a spout and an inclined pipe into a tank to lift a ball-float, whereupon a flap valve is raised by a bell crank lever and a rod. Then the comparatively clean water passes into a storage tank through a spout provided with an inclined baffle-plate, which turns the water into the inclined pipe when the flap valve is closed. The tank containing the ball-float has a gauge-glass, an outlet tap, a detachable cover, and a guide-rod for the rod of the float. The spout has an inspection-door near the valve, and the two tanks are entirely covered in, a few small vent-holes excepted.

11,360.—GLOBE HOLDERS FOR ELECTRICAL ARC LAMPS: *K. Weinert.*—The globe is made sufficiently large to contain the supports of the lower carbon, and hangs from the plate by a flange which is held between the packing-rings by a metal ring held against a rim upon the plate by two rollers sustained by spring-supported pins; the metal ring is slotted, and has inclines whereby it is placed into position upon the rollers.

11,372.—WIRE ROPE AND CORD STRAINERS: *A. J Roberts & G. Crees.*—A bar, pivotted at one end, and provided with a V-shaped block which overlaps the sides of the lever, grips the wire in a notch in the lever. The end of the lever nearer to the pivotted end of the bar is used as a fulcrum, and the bar is secured by a ring around the opposite end of the lever.

11,388.—CIRCULAR-SAW GUARDS: *R. W. Tayler.*—The guard is adapted for saws of different diameters; thumb-screws clamp two curved plates on the ends of two levers, whose other ends are joined by links to lugs upon the supporting bracket, the levers being pivotted to the end of a slotted plate where they cross one another; for the adjustment of a smaller saw the slotted plate is pushed down and the shields are moved to their new position by means of the links.

11,412.—CIRCULAR-SAW BENCHES: *J. W. Hebb & G. Squire.*—The saw, when not in use, can be lowered beneath the top of the bench, its shaft being mounted in counterbalanced arms that turn freely upon the main shaft; the saw, which is rotated by pulleys on the shafts and driving bands, is gradually raised for cross-cutting purposes by a pivotted treadle linked to the outer arm, and

COMPETITIONS, CONTRACTS, AND PUBLIC APPOINTMENTS.

CONTRACTS.

Nature of Work or Materials.	By whom Required.	Forms of Tender, &c. Supplied by	Tenders to be delivered.
Six Houses, Greystone-road, Carlisle	J. Whitfield.....	Johnstone Bros. Archt. 39, Lowther-st. Carlisle ..	Sept. 25
Sixteen Houses, Quarry-road, Bulwell	.....	F. C. Martin, C.E. Angel-row, Nottingham	do.
*Erection of Iron Emergency Staircases at Union Workhouse, Watford	Watford Union	C. P. Avres, 14a, High-st. Watford	Sept. 26
Additions to School, Barn-street ...	Haverfordwest Sch. Bd.	D. E. Thomas, Archt. Victoria-pl. Haverfordwest	do.
Houses, Moray-street, Elgin, N.B.....	.....	Sutherland & Jamieson, Archt. Elgin.....	do.
Out Offices, &c. Gamnel-road Schools	Walthamstow Sch. Bd	W. A. Longmore, Archt. Hoe-st. Walthamstow ..	do.
Steel Rails (15,000 tons), &c.....	Indian Government ..	Director General of Stores, India Office, S.W.	do.
Portland Cement	Edmonton U.D.C.	G. E. Eachus, Engr. Town Hall	do.
Road Maintenance	Kilkenny R.D.C.	K. Comerford, Council Offices	do.
House, Loch Awe, N.B.	A. B. Bach	Peddie & Co. Archt. 8, Albyn-place, Edinburgh	Sept. 27
*Granite or Quartzite for Metalling the Roads within their District ..	Grays Thurrock U.D.C.	Arthur C. James, Council Offices, Grays	Sept 28
Villa, Longtown, Carlisle	.....	G. Armstrong, Archt. 24, Bank-st. Carlisle.....	do.
Alterations to Workhouse.....	Ormskirk Union.....	Mr. Dod, Archt. 16b, Exchange-bldgs. Liverpool	do.
Additions to Dispensary Residence ..	Kinsale (Ireland) Union	R. Evans, C.E. 53, South Mall. Cork	do.
*Making-up Roads	Wood Green U.D.C. ..	C. J. Gunyon, Town Hall, Wood Green	Sept. 29
Additions to Club House, Stotfield, Elgin	.....	Reid & Wittet, Archt. Elgin	do.
School, &c. Hall-street, Chelmsford ..	.....	C. Pertwee, Archt. Bankchambrs. Chelmsford	do.
Additions to Ocean View, Aberystwith	Mrs. Kensit	Hipkins & Bassett, Archt. Terrace-rd. Aberystwith	do.
*Coastguard Buildings, Margate	Admiralty	Director, 21, Northumberland-avenue, W.C.	do.
Glazed Pipes, &c. Patricroft, Lancs. ..	Barton R.D.C.....	Mr. Hooley, C.E. Union Offices, Patricroft	do.
Workshop, &c. at Waterworks, Gayton	King's Lynn Corp.....	H. J. Weaver, C.E. Town Hall	Sept. 30
Library, Grangetown	Cardiff Corp.	E. M. BruceVaughan, Archt. St. Mary-st. Cardiff ..	do.
Boundary Walls, &c. North Embankment	Dartmouth Corp.	T. O. Veale, Surv. Town Hall	do.
Additions to Town Arms Hotel, Bodmin	W. Hicks	T. H. Andrew, Archt. 1, Trevarrick-villas, St. Austell	do.
Additions, &c. Castlebay School, Lochboisdale, N.B.	Barra Sch. Bd.	Mr. Hill, Lochboisdale, N.B.	do.
House, &c. Ackworth-rd. Pontefract..	J. E. Poppleton	Tennant & Bagley, Archt. Ropergate, Pontefract ..	do.
Paving, Kerbing, &c. nr. Wolverhampton	Heath Town U.D.C. ..	R. E. W. Berrington, Engr. Wolverhampton ..	do.
C.I. Pipes, Earlestown, Lancs.....	Newton-in-Makerfield U.D.C.	Mr. Lloyd, Engr. Town Hall, Earlestown.....	do.
Ornamental Iron Gates, &c.	Horsham Burial Com.	R. Henwood, 17, London-rd. Horsham.....	do.
Laying 19½ miles of Pipes	Nottingham Corp.....	Sir S. G. Johnson, Guildhall, Nottingham	do.
*Fencing for New Cemetery	Sunbury-on-Thames U.D.C.....	H. F Coales, Surv. Council Offices, Sunbury-on-Thames	Oct. 2
*Laying New Cemetery.....	do.	do.	do.
Stabling, &c.	Handsworth (Staffs) U.D.C.	E. Kenworthy, C.E. Council Offices	do.
Two Cottages, Culsville Station, Ireland	G. N. Ry. Co. (Ireland)	T. Morrison, Amiens-st. Terminus, Dublin	do.
Walls, &c. Brooke Park, Londonderry	Brooke Park Trustees	M. A Robinson, C.E. Richmond-st. Londonderry ..	do.
Engine House, &c Luton, near Chatham	Waterworks Co.....	Taylor, Sons & Co. Engr 27, Great George-street, S.W.	do.
Additions to Mosley Cottages	Burton-on-Trent Corp.	G. T. Lynam, Boro Engr. Town Hall	do.
Boilers	Huddersfield Corp. ..	A. B. Mountain, Electrical Engr, St. Andrew's-rd.	do.
Footbridge, Newtownstewart	G. N. Ry. Co. (Ireland)	T. Morrison, Amiens-st. Terminus, Dublin	do.
Steel and Iron Pier	CromerProtectionCom.	Douglass & Arnott, Engrs. 15, Victoria-st. S.W. ..	do.
Guernsey Granite.....	Hanwell U.D.C.	P.J. Dennis, Council Offices Surv.'s Dept. Lewisham	do.
*Kerbing and Tarpaving, &c Silvermere-road, Catford.....	Lewisham B. of W. ..	Town Hall, Catford, S.E.	Oct. 3
*Kerbing and Tarpaving, &c. Trasliham-road, Brockley..... ..	do.	do.	do.
*Kerbing and Tarpaving Davenport-road, Catford	do.	do.	do.
*Construction of New Station at Notting Hill and Ladbroke Hill ..	G. W. & Metropolitan Railways.....	Engr. Hammersmith and City Railway, Paddington Station, W.	do.
Thirty Cottages, Didcot.....	G. W. Ry. Co.	G. K. Mills, Paddington Station, W.	do.
Station Buildings, Colwall, Herefordshire..	do.	do.	do.
Church Spires, Church of the Sacred Heart, Omagh	.....	W. Hague, Archt. 50, Dawson-st. Dublin	do.
Sluice Valves	East Dereham U.D.C.	H. G. Hinson, Surv. Theatre-st.	do.
Main Sewers, Hale, Cheshire	Bucklow R.D.C.....	J. M'D. M'Kenzie, Surv. 7 Market-st. Altrincham..	do.
*Hoggin, Flints, and Shell Gravel to Victoria Park, &c.	L.C.C	Parks' Dept. 9, Spring Gardens, S.W.	Oct. 4
Additions to School	Bucknall (Lincs.) Sch. Bd.	A.E. Applewhite, Buckuall Lincoln	do.
Waterworks, Doneraile, Ireland	Mallow D.C.....	M. Regan, Council Offices, Mallow	do.

CONTRACTS—*Continued.*

Nature of Work or Materials.	By whom Required.	Forms of Tender, &c. Supplied by	Tenders to be delivered.
Rebuilding, &c. Electric Light Works	Hastings Corp.	P. H. Palmer, C.E. Town Hall	Oct. 5
Chimney Shaft, Brede Bridge	do.	do.	do.
*Partial Rebuilding and Alteration to Electric Light Works	Cty. Boro. of Hastings	P. H. Palmer, Town Hall, Hastings	do.
*Erection of Hospital at Lodge Moor, Sheffield	City of Sheffield	Flockton, Gibbs, & Flockton, 15, St. James-row, Sheffield	do.
Additions to National Gallery of Ireland, Dublin	.....	T. N. Deane & Son, Archt. 3, Upper Merrion-street, Dublin.....	Oct. 6
Additions to School, Trerobart, Ynysybwl	Llanwonno Sch. Bd...	A. O. Evans, Archt. Pontypridd	do.
*Laying Out Clapham Common Estate	.....	W. Newton Dunn's, 1 Bucklersbury, E.C.....	do.
Jetty Extension, North Pier	Blackpool Pier Co.....	J. Walker, Talbot-square, Blackpool	do.
*Additions and Alterations to No. 7A, North-st. Horsham.....	.....	C. H. Burstow, 6, West-st. Horsham..	Oct. 7
Library, Roath	Cardiff Corp.	Teather & Wilson, Archt. Queen-st. Cardiff.....	do.
Cast-Iron Main Pipes	Edinburgh Gas Comrs.	W. R. Herring, Engr. Edinburgh	do.
*Works and Materials	Hendon U.D.C.	S. S. Grimley, Public Offices, Hendon, N.W. ..	Oct. 9
Reservoir, Moorhouses.....	Tynemouth Corp. ...	J. Mansergh, Engr. 5, Victoria-st. S.W..... ..	do.
*Construction of Engine and Boiler Houses, Coal Stores, Chimney Shaft, &c.	Cty. Boro. of Brighton	F. J. Tillstone, Town Hall, Brighton.....	Oct. 10
*New Electricity Generating Station ..	Cty. Boro. of Birkenhead	C. Brownridge, Town Hall, Birkenhead	do.
Tramways Reconstruction	Glasgow Corp.	J. Young, 88, Renfield-st. Glasgow	do.
Waterworks, Killea	Londonderry T. C. ...	J. J. S. Barnhill, C.E. 1a, Strand, Derry	do.
*Alteration and Extension of Public Baths	Hackney Vestry.....	Gordon, Lowther, & Gunton Finsbury House, Blomfield-st. E.C.	Oct. 11
*Work and Materials.....	War Department	Royal Engr. Office, 41, Charing Cross, S.W.	do.
Workhouse, Infirmary, &c. New Cross.....	Wolverhampton Union	A. Marshall, Archt. Kingst. Nottingham	Oct. 12
Cemetery Buildings, Groby-road.....	Leicester Corp.	Goddard & Co. Archt. 6, Market-st. Leicester	Oct. 13
Engine House, &c. Frampton Cotterell	West Gloucestershire Water Co.	E. D. Marten, C.E. Codsall, Wolverhampton	Oct. 16
*Alteration and Additions to Workhouse, Parish-st. Tooley-st. S.E. ..	St. Olaves Union	Neuman & Neuman, 31, Tooley-st. S.E.	Oct. 17
Forming, &c. Back Streets, Hexthorpe	Balby-with-Hextborpe U.D.C..	G. Gledhill, Surv. Highrd. Balby	Oct. 18
Reservoir, Cast Iron Pipe Mains, &c. Purton....	Cricklade, &c. R.D.C.	F. Redman, Engr. Newport-st. Swindon.... ..	do.
Fifty Electric Tramcars	Leeds Corp.	T. Hewson, C.E. Municipal-buildings	do.
Road Improvement Works	Little Hulton (Lancs.) U.D.C..	C. C. Hooley, C.E. 34, Brazennose-street, Manchester	Oct. 23
*Lease for Houses, at Queen Anne's Gate	Christ's Hospital	Clerk, Christ's Hospital, Newgate-st E.C.	Oct. 30
Sewerage Works, &c.	Darton (Yorks.) U.D.C	W. H. Radford, C.E. Angel row, Nottingham	Nov. 10
*Taking-down and Re-building.....	Perseverance Club and Institute.....	H. S. Jones 17 & 19, Churchrd. Homerton	No date
Two Houses, Featherstone, Yorks. ..	A. Day	W. H. Fearnley, Archt. Featherstone.....	do.
Additions to Foresters' Arms Inn, Graffham, Sussex	.....	A. Pursley, Graffham	do.
Inn and Premises, Little Lever, Lancs.	Chadwick's Walmersley Brewery Co.	D. Hardman, Archt. Silver-st. Bury.....	do.
Shop, 9, Cross-st. Abergavenny	G. W. Shickleton	B. J. Francis, Archt. Abergavenny.....	do.
Farmhouse, Billesley	.....	G. H. Hinton, Archt. 11, Church-st. Stratford-on-Avon	do.
Twelve Cottages, Clay Cross, Derby ..	.....	W. M. Ashmore, Archt. New Queen-st. Chesterfield	do.
Laundry, &c. Burnham.....	Wolstanton & Burslem Union	W. H. Whalley, Archt. Queen-st. Burslem.....	do.
Alterations, Commercial-st. Hereford	T. Corner	W. W. Robinson, Archt. Hereford	do.
Additions to Rolston Hall, Hornsea, Yorks.	...	Brodrick & Co. Archts. 77, Lowgate, Hull	do.
Gas Mains	Driffield U.D.C.	G. B. Tonge, Council Offices	do.
Laying 1 mile Cast Iron Pipes.....	.....	Normanby Brick Co. Ltd. Normanby	do.
Cast Iron Pipes, Cooper Bridge, Brighouse	.....	T. H. Churton, Electrical Works, Leeds	do.
Making up Two Streets, Greengates..	Watson, Son, & Smith	W. J. Beally, Surv. 23, Bank-st. Bradford	do.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary.	Application to be in.
*Surveyor to take off quantities for New Baths and Wash-houses.....	Vestry of St. Pancras	H. F. Barrett, Vestry Hall, St. Pancras, N.W.	Sept. 29
*Clerk of Works	Parish of All Saints, Poplar	4l. 4s. per week	Oct. 2
*Engineering Draughtsman	City of Nottingham ..	100l. per annum	Oct. 9
*Architectural Draughtsman.....	do.	150l. per annum	do.

Those marked with an asterisk (*) are advertised in this Number. ***Competitions, p. —. Contracts, pp. iv. vi. viii. x. & xix. Public Appointments, pp. xvii. & xix.***

for straight sawing is fixed in its highest position by a forked lever, which embraces the outer arm.

11,489.—HAND BEADING OR MOULDING PLANES: *A. Novitski.*—A rounded recess is hollowed between two rounded projections, which differ in their lengths and widths, upon the lower part of the body of the tool. On the one cutter are formed a rounded cutting edge and a doubly-curved cutting edge, and on the other a rounded cutting edge. Set-screws secure an adjustable fence.

11,572.—BRAZING APPARATUS: *R. Jones.*—The appliance, for use with a portable forge, has a gas blow-pipe adjustably mounted on the blast-pipe between the tuyère and the bellows. In an elbow or T-piece on the blast-pipe is a pipe containing within it a sliding pipe supporting a hemispherical casing. The blow-pipe and gas-pipe are joined to a second casing, which is connected by a bridle and a pivot screw to a third casing, whereby the blow-pipe can be swivelled in a vertical plane, whilst the two telescopical pipes allow vertical or angular adjustment of the blow-pipe. The blast passes up through the third casing into the hollow end of a valve (turned by a handle) in the second casing, and thence through an orifice to the blow-pipe. Gas passes through a chamber within the valve by an inlet and an outlet.

11,590.—TESTING DRAINS: *W. H. Hammond.*—A nipple is screwed in the neck of the bulb which contains the chemical; when needed for use, the bulb, its top having been cut off, is joined with a flexible tube to an air pump, washed into the drain, and exploded by air pressure; the bulb may be enclosed in a water-bag of rubber or gelatine, or it may be discarded and the water-bag be used alone.

11,665.—POLISHING COMPOUND: *A. M. Horn & L. D. Duke.*—A solution obtained by dissolving Castile soap in turpentine is added to an admixture of vinegar, turpentine, and unboiled linseed oil, which can then be used for furniture, enamelled surfaces, &c.

11,673.—LADDERS: *R. Killip.*—Through the wooden rung, or round, is passed a steel or metal rod secured with washers or nuts, and with rivets; the nuts have holes for a forked key or wrench, which are filled with white lead, and the nuts or washers are made concave or dished in order that their edges may be weather-tight.

11,706.—SAFETY SUSPENDING OR RETAINING APPARATUS FOR COLLIERY CAGES, &C.: *A. W. Prest & A. Teale.*—A base-plate on the top of the cage supports an apparatus after the kind following:—Four gripping arms, which engage with the rope or guides, are pivotted on to lugs upon the plate, being normally kept in disengagement from the guides by means of sliding pins that pass through lugs and are carried by bars, coupled by links to curved bars pivotted between standards; to a slotted piece which slides upon the standards are attached brackets, to which chains from the hoisting rope's ring are coupled. If the rope breaks, the slotted piece is forced down by springs, whereupon the curved bars draw out the pins and thus liberate the gripping arms, which may be positively turned by levers moved by the slotted ends of the chain brackets, or may be turned to grip the guides upon their frictional contact with them.

11,716.—ACETYLENE LAMPS: *Sir C. S. Forbes.*—For a table lamp, a tube, closed by a cap on to which the burner is screwed, is supported by a diaphragm, and a sloping nozzle is screwed into a drip tube which is screwed into the bottom of one vessel. The aperture through which the water is supplied has a gauze cover and a screw cap, so that the water, on passing through the lower tube, rises up to the sloping nozzle and drips upon the carbide within the generator below. Should the gas be generated too quickly, the water is forced back up the lower tube and the supply is arrested. The form of generator described can be adapted to lamps of other kinds.

SOME RECENT SALES OF PROPERTY:

ESTATE EXCHANGE REPORT.

September 1.—By DICKINSON & RIGGALL (at Grimsby).

Great Grimsby, Lincs.—271 to 287 (odd), Henage-st., u.t. 84 yrs., g.r. 25*l.*, r. 156*l.*	£1,700
September 7.—By G. BILLINGS (at Mainstone).	
Maidstone, Kent.—13, 15, and 17, Stone-st., f.	1,110
By W. DAY (at Maidstone).	
Marden, Kent.—Tonbridge-rd., Draycott, and 1a. 3r. 5p., f.	3,250
By CHAS. BOARDMAN (at Haverhill).	
Kedington, Suffolk.—Ruse's Farm, 229a. 0r. 7p., f.	2,900
Twelve freehold tenements, r. 46*l.* 9s.	395
By HARDS & BRADLY (at Eltham).	
Eltham, Kent.—10, Park-lane, f., e.r. 40*l.*	510
4, Back-lane, f., r. 15*l.* 12s.	205
September 8.—By THOMPSON, WHITTON, & LAING (at Exeter).	
Cheriton Bishop, Devon.—Haylake's Farm, 61a. 0r. 5p., f.	1,003
Heavitree, Devon.—The Witchett Field, 2a. 3r. 10p., f.	600
Tewkesbury, Glos.—The Manor of Tewkesbury, with manorial rights, &c.	128
Exeter, Devon.—Sidwell-st., a plot of garden ground, area 23,000 ft., f.	165
Exmouth, Devon.—Esplanade, Templeton Lodge, u.t. 67 yrs., g.r. nil.	1,200
Whitestone, Devon.—Bowlish Farm and Whiptail Wood, 224a. 3r. 38p., f.	1,600
September 9.—By Messrs. SPELMAN (at Norwich).	
Pulham St. Mary Magdalene, Norfolk.—The Hill or Lands Farms, 40a. 1r. 16p., f. and c.	340
By SEWELL & BARNES (at Norwich).	
Potter Heigham, &c., Norfolk.—Heigham Sounds and White Sled Estate, 149a. 3r. 38p., f.	1,525
By COOPER & WACHER (at Canterbury).	
Herne, Kent.—Love-st. Farm, 63a. 2r. 23p., f.	1,900
Sturry, Kent.—Enclosures of land, 32a. 1r. 16p., f.	1,080
September 11.—By H. J. CHEFFINS.	
Steeple Bumpstead, Essex.—Herkstead Hall, 175a. 2r. 34p., f.	1,500
By GRIMLEY & SON and W. DEW & SON (at Barmouth).	
Barmouth, Merioneth.—Belle Vue, area 3,944 yds., f.	3,000
1, 2, and 3, Belle Vue Residences, f.	3,730
St. John's Church-rd., &c., four building sites, f.	1,980
1 to 10, Belle Vue Arches, f.	2,700
Harlech-rd., &c., nine building sites, f.	1,316
Main-rd., three building sites, f.	955
Brynmynach Castle and 6a. 0r. 24p., u.t. 85 yrs., g.r. 57*l.*	1,850
Llanbedr, Merioneth.—Cellfechan Farm, 216a. 1r. 37p., f.	1,600
Ceilwart Uchaf Farm, 120a. 2r. 17p., f.	2,010
Harlech-rd., a plot of garden ground, f.	150
By A. G. GRIFFITHS (at Ludlow).	
Burford, &c., Salop.—The Whitton House Estate, 85a. 0r. 22p., f.	3,190
September 12.—By GIDDY & GIDDY.	
Harrow, Middx.—Gayton-rd., Wyvenhoe, f.	1,500
By HUGHES & Co.	
Caledonian-rd.—90, Copenhagen-st., u.t. 44 yrs., g.r. 12*l.*, r. 40*l.*	285
By JAMES TURNBULL (at Newcastle).	
Coxhoe, Durham.—The Park Hill Estate, 148a., f.	6,000
September 13.—By BAXTER, PAYNE, & LEPPER.	
Spitalfields.—13, Brushfield-st., f., r. 50*l.*	1,410
By DOUGLAS YOUNG & Co.	
Islington.—3 and 4, Waterloo-terr., u.t. 32 yrs., g.r. 13*l.*, r. 74*l.*	480
Ilford, Essex.—152, Thorold-rd., u.t. 98 yrs., g.r. 5*l.* 10s., e.r. 28*l.*	250
September 14.—By RUTLEY, SON, & VINE.	
St. Pancras.—4, 5, 6, 7, and 13, Crawley Mews, u.t. 44 and 48 yrs., g.r. 14*l.*	995
Kilburn.—Percy-rd., f.g.r. 52*l.*, reversion in 72 yrs.	1,270
Peckham.—17, Trafalgar-sq., u.t. 76 yrs., g.r. 6*l.*	225
September 15.—By HARDING, LOW, & HARDING.	
South Mimms, Middx.—Pope's Farm, 59a. 1r. 33p., f.	3,010
Potter's Bar, Middlesex.—Baker-st., Crossland's Enclosures, 12a. 2r. 32p., f.	2,010
By A. J. SHEFFIELD.	
Poplar.—287 to 309 (odd), Brunswick-rd., u.t. 66 yrs., g.r. 52*l.*	3,110
20 to 34 (even), Ricardo-st., u.t. 58½ yrs., g.r. 10*l.*	1,145
39, Zetland-st., u.t. 66 yrs., g.r. 4*l.* 10s.	330
25, Rook-st., f.; and 12, 21, 22, 43, and 44, Rook-st., u.t. 44 yrs., g.r. 14*l.* 7s.	375
Canning Town.—2 to 24 (even), Greenville-st., u.t. 999 yrs., g.r. 63*l.*	2,045
Victoria Docks.—83, Burrard-rd., f., r. 30*l.*	550
Silvertown.—2 to 12 (even), Cranbrook-rd., u.t. 79 yrs., g.r. 21*l.*	530

Contractions used in these lists.—F.g.r. for freehold ground-rent; l.g.r. for leasehold ground-rent; i.g.r. for improved ground-rent; g.r. for ground-rent; r. for rent; f. for freehold; c. for copyhold; l. for leasehold; e.r. for estimated rental; u.t. for unexpired term; p.a. for per annum; yrs. for years; st. for street; rd. for road; sq. for square; pl. for place; ter. for terrace; cres. for crescent; yd. for yard, &c.

TO CORRESPONDENTS.

NOTE.—The responsibility of signed articles, letters, and papers read at public meetings, rests, of course, with the authors.

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Letters or communications (beyond mere news items) which have been duplicated for other journals are NOT DESIRED.

We are compelled to decline pointing out books and giving addresses.

Any commission to a contributor to write an article is given subject to the approval of the article, when written, by the Editor, who retains the right to reject it if unsatisfactory. The receipt by the author of a proof of an article in type does not necessarily imply its acceptance.

All communications regarding literary and artistic matters should be addressed to THE EDITOR; those relating to advertisements and other exclusively business matters should be addressed to THE PUBLISHER, and *not* to the Editor.

TENDERS.

[Communications for insertion under this heading should be addressed to "The Editor," and must reach us *not later than* 10 *a.m. on Thursdays.* N.B.—We cannot publish Tenders unless authenticated either by the architect or the building-owner; and we cannot publish announcements of Tenders accepted unless the amount of the Tender is given, nor any list in which the lowest Tender is under £100, unless in some exceptional cases and for special reasons.]

* Denotes *accepted.* † Denotes *provisionally accepted.*

BASINGSTOKE.—For the construction of a sewer, Lower Brook-street. Mr. Geo. Fitton, Borough Surveyor, Town Hall, Basingstoke:—

Collier & Catley, Reading*	£367

BRISTOL.—For the erection of new branch offices, for the Star Life Assurance Society. Mr. A. Blomfield Jackson, architect, 26, Mecklenburgh-square, London:—

E. Walters	£16,535	Stephens & Bastow	£14,749
J. Perkins	16,100	G. Humphreys	14,600
W. Cowlin	15,859	A. J. Beaven*	14,200

CHESHUNT.—For the erection of two villa residences, Albury Ride, for Mr. T. Hamilton. Mr. F. W. Adams, architect and surveyor, Finsbury Circus Buildings, 18, Eldon-street, E.C.:—

Jennings & Grenfell*	£920

CHESHUNT.—For the erection of two villa residences, Crossbrook-street, for Mr. R. Hamilton. Mr. F. W. Adams, architect and surveyor, Finsbury Circus Buildings, 18, Eldon-street, E.C.:—

Lane	£942	Jennings & Grenfell*	£940

CHESHUNT.—For the erection of a manse, Albury Ride, for the Rev. D. Thomas. Mr. F. W. Adams, architect and surveyor, Finsbury-circus Buildings, 18, Eldon-street, E.C.:—

W. Gardener	£1,120	Jennings & Grenfell*	£910

COCKERMOUTH.—For the repair of roads, Whinfell, for the Rural District Council. Mr. J. B. Wilson, C.E., Court-buildings, Cockermouth:—

	Per Annum.
John Ritson	£40 0 0
Mark Crosthwaite, Pardshaw*	33 10 0
John Anderson	33 0 0

DUBLIN.—For the erection of new branch offices, for the Star Life Assurance Society. Mr. A. Blomfield Jackson, architect, 26, Mecklenburgh-square, London:—

H. Pemberton	£15,350 0 0	McLaughlin & Harvey	£13,996 7 5
W Beckett	14,590 10 0	J. Beckett	13,850 0 0
Bolton & Sons	14,460 0 0	Collen Bros.*	13.490 0 0

FINEDON (Northants).—For the erection of schools. Messrs. Talbot, Brown, & Fisher, architects, Wellingborough:—

F. Henson, Finedon	£2,996

GREENWICH.—For alterations and additions to "The Ship and Sailor" p.-h., Church-street, Greenwich, S.E., for Mr. Thomson. Mr. Edmund J. Strevens, architect, 246, Camberwell-road, S.E. Quantities supplied:—

Edwards & Medway	£1,647	J. Tyerman	£1,183
Whitehead & Co.	1,450	W. Cook	1,130
Falkner & Sons	1,287	Scotney & Wootten	1,099
H. L. Holloway	1,242	Hy. Line	1,029
G. Newton	1,230		

GREENWICH.—For structural alterations, painting, &c., to the "Admiral Hardy" public-house, Clarence-street, Greenwich, S.E., for Mr. W. Smith. Mr. Edmund J. Strevens, architect, 246, Camberwell-road, S.E. Quantities supplied:—

		Painting, &c.
Whitehead & Co.	£1,475	£115
G. Newton	1,451	105
J. Tyerman	1,407	97
Little & Senecal	1,388	97
Falkner & Sons	1,387	137
Wm. Cook	1,279	93

GREENWICH.—For the erection of artisans' dwellings at Greenwich, for the Greater London Property Company, Limited. Mr. Alfred Roberts, architect, 18, Nelson-street, Greenwich, S.E.:—

F. & H. F. Higgs	£2,734	T. D. Leng	£2,296
Hayter & Son	2,400	W. Martin*	2,259
Jones & Groves	2,355		

HALIFAX.—For the extension of engine-room, &c., at electricity works, for the Corporation. Mr. W. H. D. Horsfall, architect, Town-chambers, Silver-street, Halifax:—

Masonry.—Ben Riley, Lewis-street, Halifax	£2,250	0	0
Joinery.—Sam Greenwood, Boothtown, Halifax	253	0	0
Plumbing and Glazing.—William Ward, Broad-street, Halifax	195	10	6
Ironwork.—Lee & Harrison, Leeds	293	1	6
Concreting.—Greenwood & Sons, Brunswick-street, Halifax	130	7	6
Slating and Plastering.—Rushworth & Firth, New Bank, Halifax	153	0	0
Painting.—Thomas Kendal, Queen's-road, Halifax	35	10	3

HENSBRIDGE (Somerset).—For the construction of a reservoir, for the Wincanton Rural District Council. Mr. C. Coombs, engineer, Tisbury:—

Materface, Honiton	£1,010

IPSWICH.—For additions to Borough Fever Hospital, for the Corporation. Mr. E. Buckham, Borough Surveyor, Town Hall, Ipswich:—

Parkington & Son	£2,624	Roper	£2,566
Linzel	2,585	Borrett, Ipswich*	2,550

IRVINE (N.B.)—For the erection of academy for the Burgh School Board. Mr. J. Armour, jun., architect, Irvine. Quantities by Messrs. John Dansken & Purdie, I.M., West George-street, Glasgow:—

Masonry.—MacLachlan & Sons*	£5,529	12	4
Joinery.—C. Wark*	2,438	17	3
Plumbing.—J. Johnston*	711	1	9
Slating.—J. Johnston*	266	16	8
Plastering.—D. Stobie*	380	16	0
Heating.—Hall & Sons*	386	11	6
Total	£9,713	15	6

KENSINGTON.—For the erection of shops, Nos. 225 and 227, Kensington High-street. Mr. W. L. Eves, architect, 54, High-street, Uxbridge:—

Higgs & Hill	£4,984	Lole & Lightfoot	£3,798
F. & H. F. Higgs	4,175	Marsland	3,785
Bywaters	4,060	Kearley, Kensington*	3,770
Holliday & Greenwood	4,020		

KENSINGTON.—For alterations and additions to 197 to 203, Kensington High-street. Mr. W. L. Eves, architect, 54, High-street, Uxbridge:—

Polden	£3,357	15	Kearley, Kensington* £2,414 15
Lole & Lightfoot	2,725	0	

KINGSTHORPE (Northampton).—For the erection of shoe factory, Bective Estate, Kingsthorpe, for Messrs. James Branch & Sons. Messrs. Mosley & Anderson, architects, Northampton. Quantities by the architects:—

E. Green	£7,884	W. Beardsmore	£5,934
R. Cosford	7,000	H. Green	5,900
Sharman & Son	6,585	W. Heap	5,860
Wingrove & Stanley	6,493	A. P. Hawtin	5,846
C. Webster	6,344	A. J. Chown*	5,700
G. J. Fisher	6,280		

LONDON.—For the erection of a veterinary establishment and stables, &c., at Vauxhall, for Mr. W. Perryman. Mr. H. Hardwicke Langston, architect, 6, John-street, Bedford-row. Quantities not supplied:—

Bristow & Sons	£1,610	Hibberd Bros., Ltd.	£1,376
Head & Son	1,550	Falkner & Son	1,337
H. H. Sherwin	1,416	Geo. Brittain*	1,137

[Architect's estimate, £1,150.]

ENFIELD.—For the erection of a block of schools, Chase-side, for the School Board. Mr. G. E. T. Laurence architect, 181, Queen Victoria-street, E.C. Quantities by Messrs. D. Campbell & Son, 4, Finsbury-circus, E.C.:—

—	Tender.	Add if floors in hard wood.						Total.
		Pitch Pine.		Maple.		Oak.		
	£	£	s. d.	£	s. d.	£	s. d.	£
Balaam Bros.	22,200	65	0 0	186	0 0	450	0 0	—
Wilkinson & Son	22,177	51	8 6	179	19 8	462	16 6	—
W. Laurence	20,999	48	0 0	169	6 6	452	2 6	—
Martin Wells & Co.	20,199	47	0 0	167	0 0	449	0 0	—
T. Almond & Son	20,098	42	17 0	154	5 6	411	8 0	—
S. Sharpington	19,990	42	17 1	179	19 9	565	13 6	—
J. Shelbourne & Co.	19,524	47	0 0	167	0 0	437	0 0	—
King & Son	19,245	47	0 0	163	0 0	429	0 0	—
Hockley & Son	18,800	42	17 1	154	5 6	411	8 0	—
Fairhead & Son	18,347‡	51	0 0	171	0 0†	454	0 0	18,518‡

‡ Lowest tender accepted subject to approval of Education Department.

[*See also next page.*

LONDON.—For the erection of premises, 24, King-street, in connexion with St. James' Theatre. Mr. A. Blomfield Jackson, architect, 26, Mecklenburg-square, London :—

Beer & Gash*.....£5,010

LONDON.—For rebuilding "The King and Queen" p.-h., Rotherhithe-street, S.E., for Messrs. Crowley & Co. Mr. Edmund J. Strevens, architect, 246, Camberwell-road, S.E. Quantities supplied :—

Chafen & Newman £2,818 10

LONDON.—For erecting steam laundry in Lordship-lane, East Dulwich, S.E., for Messrs. Golden. Mr. Edmund J. Strevens, architect, 246, Camberwell-road, S.E. Quantities supplied :—

Henry Line £3,310 2 6

MACCLESFIELD.—For additions to school, St. Peter's. Mr. Jabez Wright, architect, 27, King Edward-street, Macclesfield. Quantities by the architect :—

J. Wellings	£1,040	John Clayton	£940
Gorton & Wilson ..	1,040	John Clayton (modified	
Roylance & Co., Ltd.	990	tender)*.....	657

[All of Macclesfield].

MELTON (Suffolk).—For the formation of roads at County Asylum for the Visiting Committee. Mr. A. J. Wood, architect, 22, Surrey-street, Strand, W.C. :—

Bentham & Co.	£1,080 17 0	Bradshaw &	
F. Bennett....	907 10 0	Co., 52, Queen	
G. Rackham..	900 0 0	Victoria-st.*	779 13 2

NORTHAMPTON.—For the erection of shoe factory, Dallington, St. James', for Mr. A. E. Marlow. Messrs. Mosley & Anderson, architects, Northampton. Quantities by the architects :—

G. F. Sharman ..	£2,750 0	G. J. Fisher ...	£2,664 0
A. J. Chown	2,750 0	E. Green.....	2,645 0
Wingrove & Stan-		A. P. Hawtin....	2,590 0
ley	2,690 0	Sharman & Son..	2,555 0
Johnson & Son ..	2,672 15	W. Beardsmore*	2,394 0

PETERSFIELD.—For alterations and additions to house and stabling at Elmwood, for Mr. George Beck. Mr. A. Blomfield Jackson, architect, 26, Mecklenburgh-square, London :—

J. Holder*.....£2,600

RUSHDEN (Northants).—For the erection of shoe factory, Rushden, for Mr. B. Ladds. Messrs. Mosley & Anderson, architects, Northampton. Quantities by the architects :—

Sparrow	£1,075	F. Henson	£1,045
T. Wilmott, jun.	1,064	R. Marriott	1,000
T. & C. Berrill	1,059	T. Swindall*.....	979
Hacksley Bros.....	1,050		

UXBRIDGE.—For the erection of business premises, Vine-street, for Messrs. Randall Bros. Mr. W. L. Eves, architect, 54, High-street, Uxbridge :—

Duncan Curry	£3,646	Ward	£2.380
Flint	2,960	Kearley	2,160
Fassindge	2,390	Buttrum, Uxbridge*	1,840

WALTHAM CROSS.—For the erection of twenty villa residences, Freezywater, for Mr. R. B. Colvin. Mr. F. W. Adams, architect and surveyor, Finsbury-circus Buildings, 18, Eldon-street, E.C. :—

A. Porter	£10,400	W. Gardener.....	£9,296
H. Almond.....	9,980	Jennings & Grenfell*	7,882
Fairhead & Sons ..	9,500		

WIGAN.—For the erection of offices, dynamo-house, boiler-house, &c., for the Corporation. Mr. H. Collings Bishop, electrical engineer, Quadrant-buildings, Wigan :—

H. & F. Lomax	£16,365 5 0	W. Winnard,	
P. A. Ablett	16,289 8 3	Wigan*....	£15,798 17 11
J. Wilson....	16,128 18 9		

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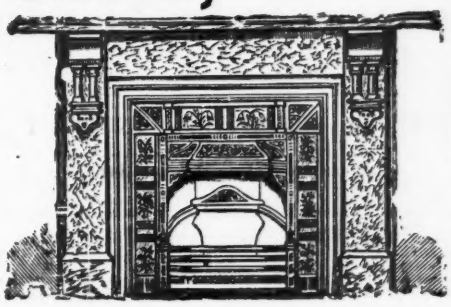

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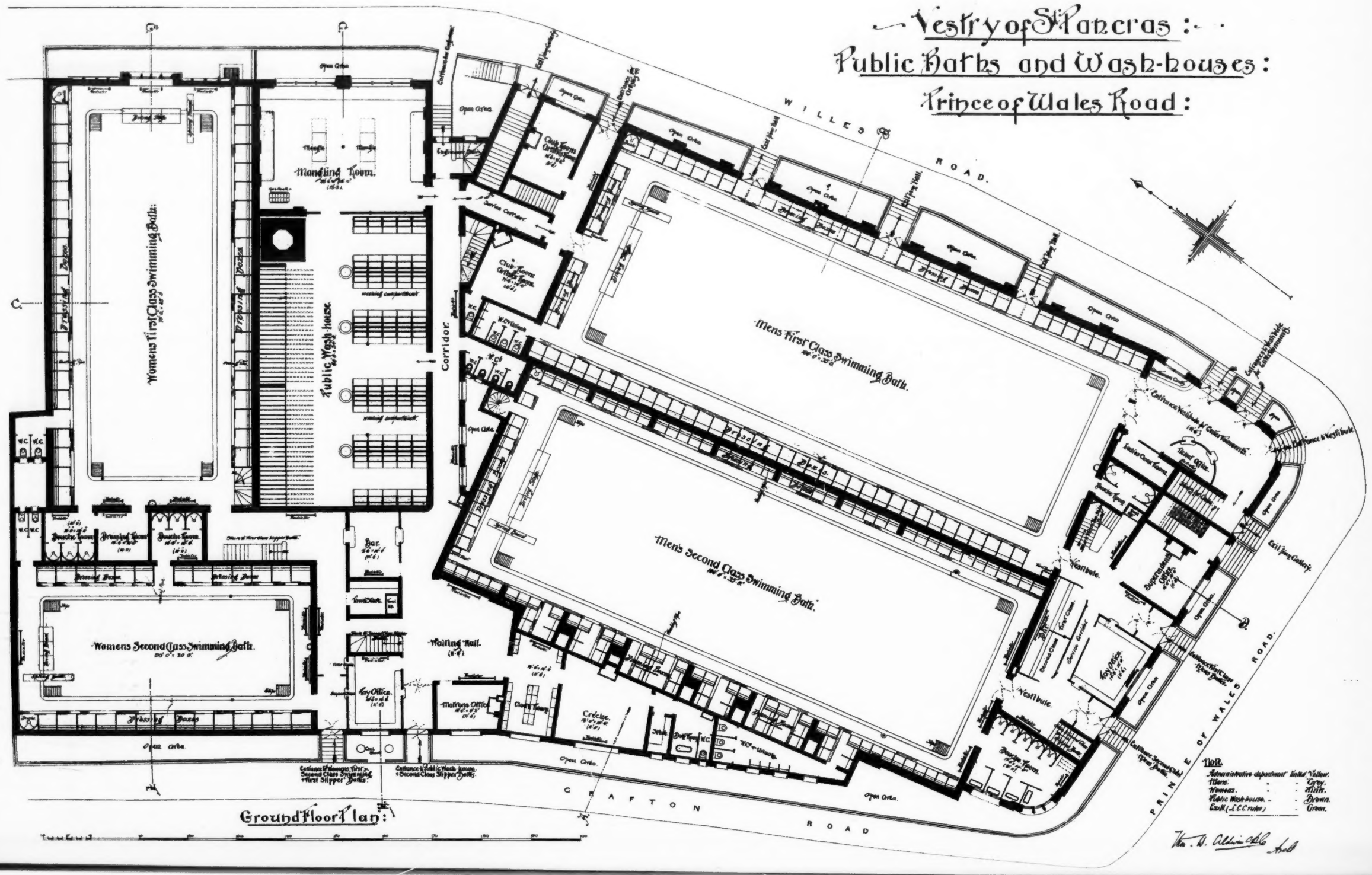

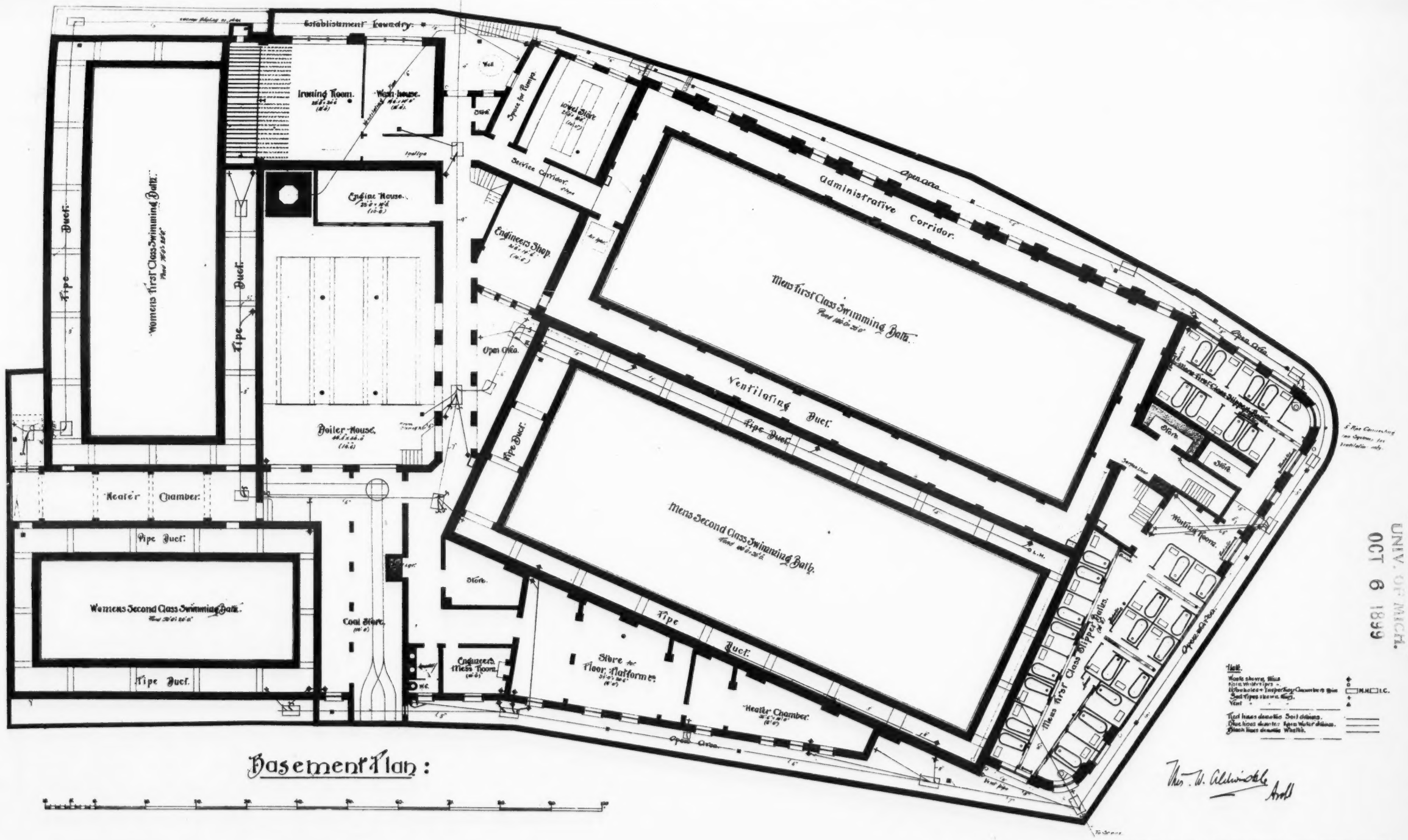

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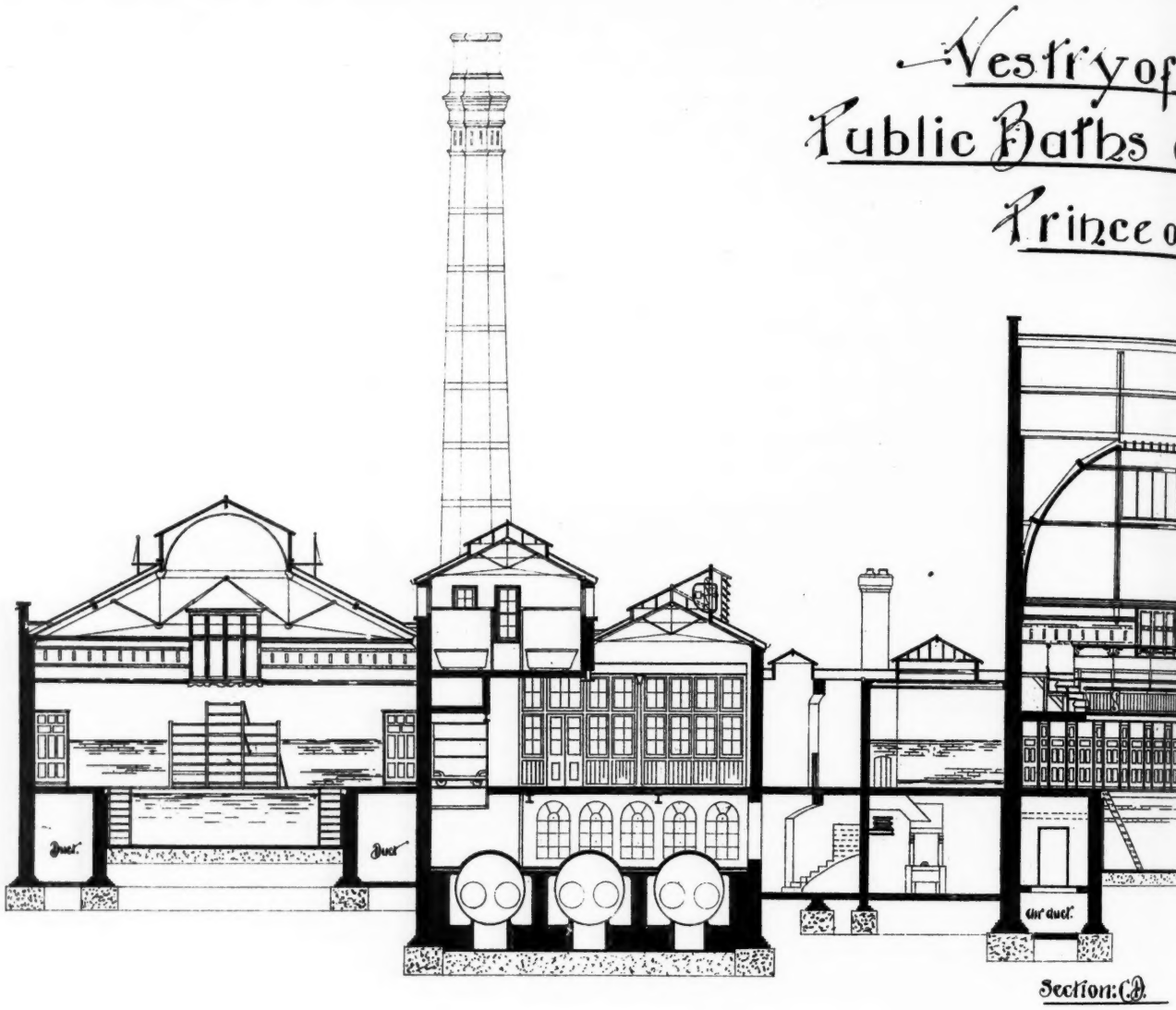

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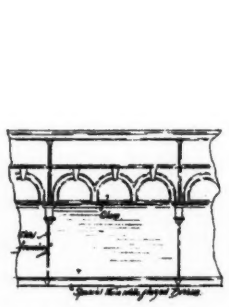

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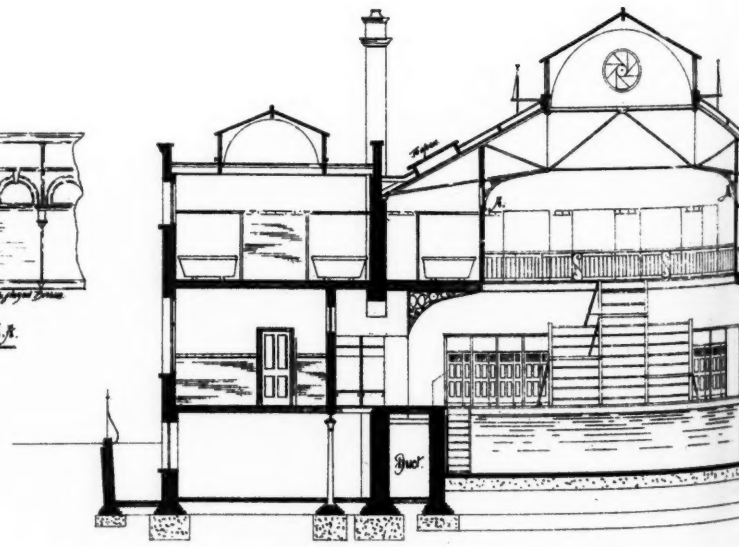

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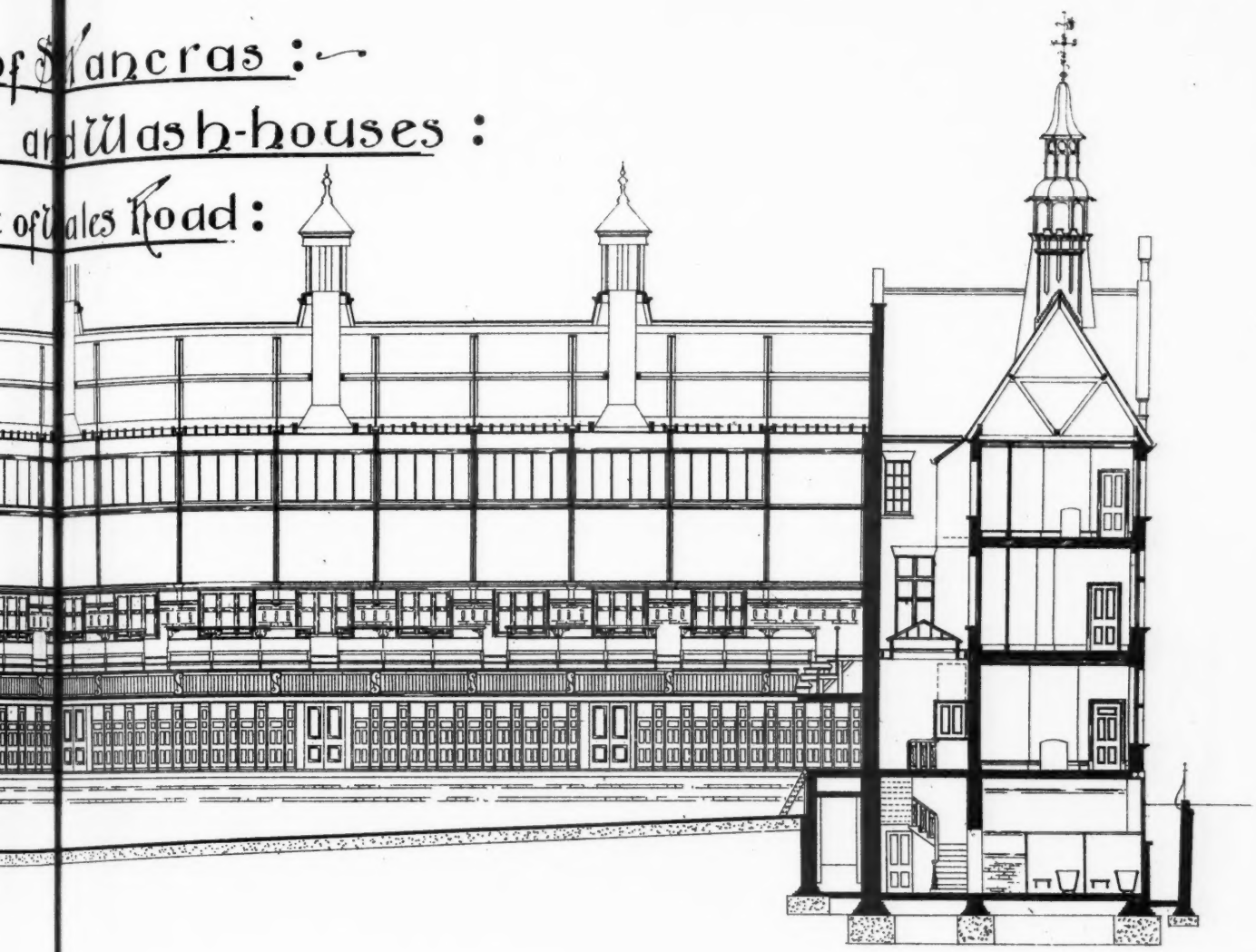
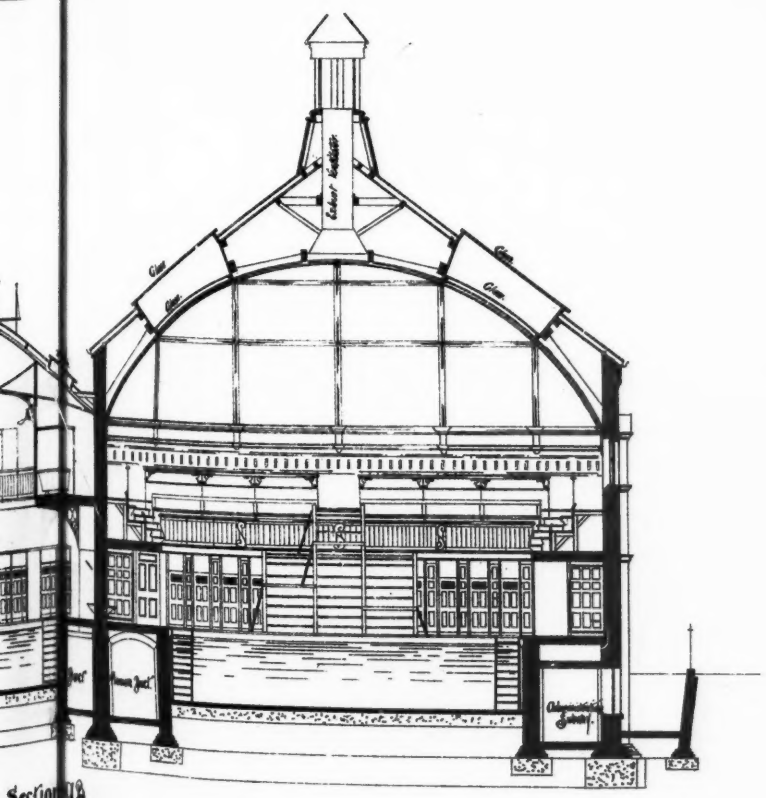
and Wash-houses :

t of Wales Road :





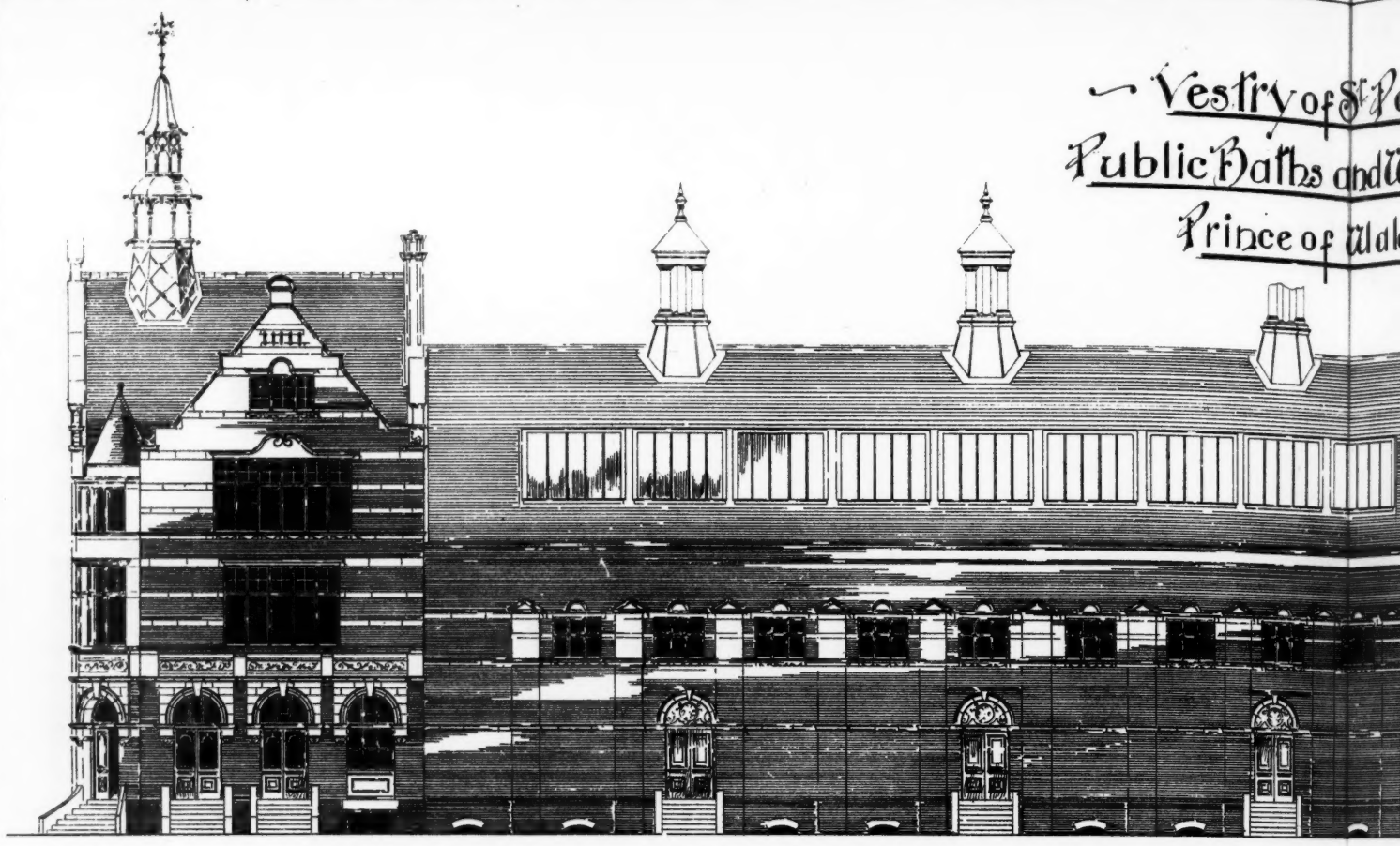
Section A B

Thos. W. Aldwinckle Arch

PHOTO-LITHO. SPRAGUE & CO. LTD. 4 & 5 EAST HARDING STREET, FETTER LANE, E.C.

UBLIC BATHS.—Mr. T. W. Aldwinckle, F.R.I.B.A., Architect.

SECTIONS.



Elevation to Willes Road:

Elevation to Prince of Wales Road:

SELECTED DESIGN FOR ST. PANCRAS PUBLIC BATHS.

ELEVATIONS AND PERSPEC

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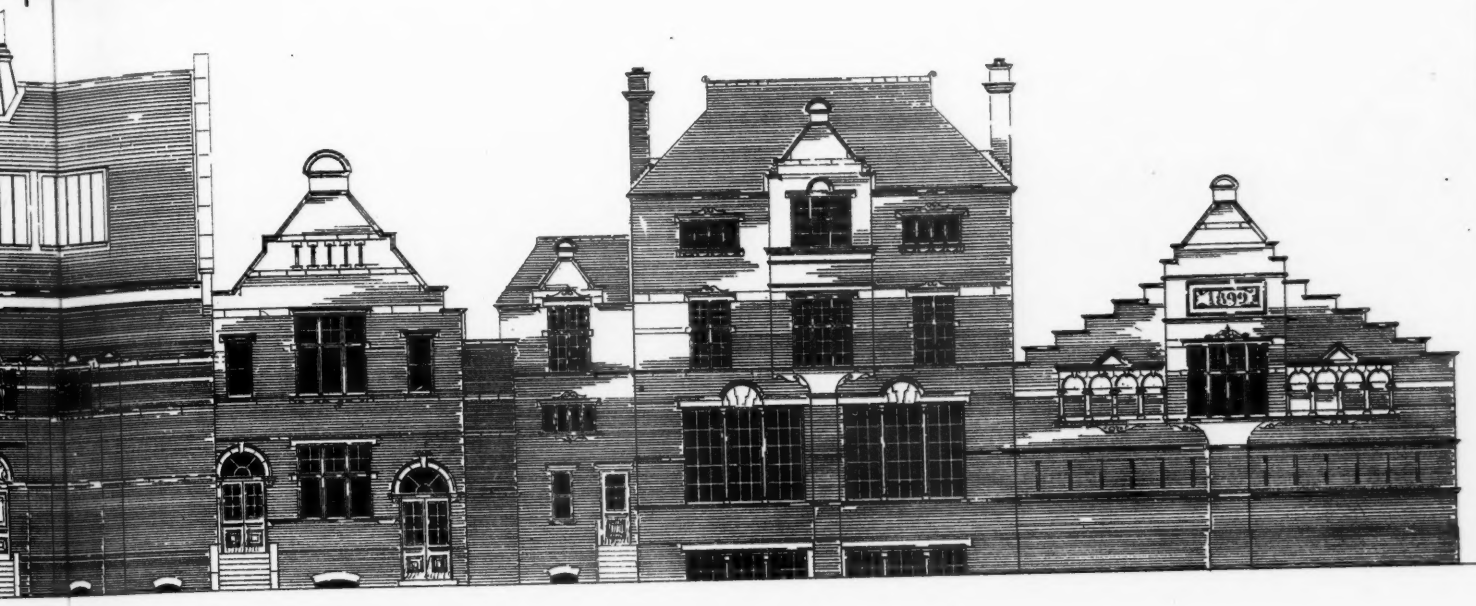
OCT 6 1899

of St Pancras :—

es and Wash-houses:

of Wales Road:



Thos. W. Aldwinckle

PHOTO-LITHO BY THE SWAN ELECTRIC ENGRAVING CO. LTD. 115 & 116 FLEET STREET, FETTER LANE, E.C.

PUBLIC BATHS.—Mr. T. W. Aldwinckle, F.R.I.B.A., Architect.

ONS AND PERSPECTIVE VIEW.

DETAIL OF THE PALAIS DE L'ÉLECTRICITÉ FOR THE PAR EXH

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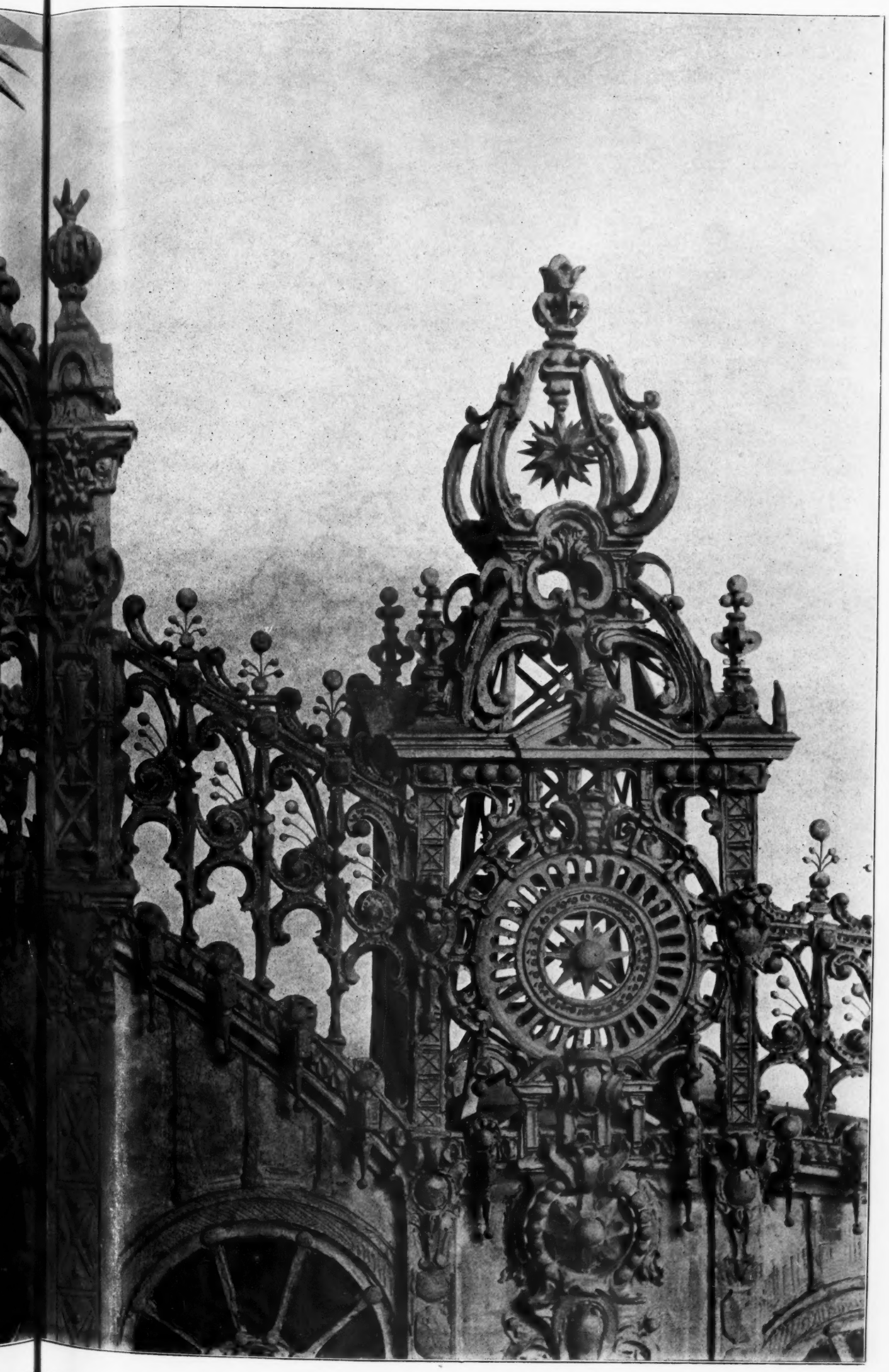
OCT 6 1899



E PAR EXHIBITION. (PHOTOGRAPHED FROM THE MODEL).—M. HÉNARD, ARCHITECT.